# electrical contracting

Maintenance Section



MAY • 1939

# *Announcing*

## TWO NEW TOOLS FOR INCREASIN YOUR FLOODLIGHTING BUSINES

**NEW SEARCHLIGHT—Price less than half that of former units**

**NEW FLUORESCENT FLOODLIGHT—Color lighting is now simple and inexpensive**

NEW opportunities for profitable floodlighting business are presented by two new G-E floodlighting units developed for the International Golden Gate Exposition at San Francisco.

The new, Type S-5, 18-inch, 1500-watt searchlight is ideal for lighting chimneys, towers, monuments, distant work operations, and, in general, objects requiring a long, narrow beam. Simplified construction makes possible a price less than half that of units formerly used for this service.

The Type L-53 fluorescent floodlight opens opportunities for applications of colored lighting which heretofore could not be made economically. The 18-inch fluorescent lamp, which is attracting wide attention for its efficient generation of colored light, makes color floodlighting amazingly inexpensive to install and to operate. This unit, best suited for decoration of buildings, signs, and amusement parks, gives a surprising amount of well-distributed colored light for only 15 watts.

There may be dozens of applications in your locality for these new lighting tools. A G-E lighting specialist will be glad to help you work out installation details. For further information, write to Dept. 6-201, General Electric Company, Schenectady, N. Y.

Outdoor lighting of the Golden Gate International Exposition was planned by General Electric lighting engineers. Special equipment developed included the Type S-5 searchlight and the Type L-53 fluorescent floodlight. Shown here is one of the two huge Elephant Towers at the main entrance


GENERAL ELECTRIC

# "How the BENJAMIN Complete Line Gets Me More Floodlighting Jobs"

**USE TABLE**

**SERVICE**—The original 2-in-1 unit especially designed for Service station lighting. Same unit spotlights buildings and floodlights the pumps.

**LONG-RANGE**—An Alzak aluminum floodlight for football lighting where floodlights are located behind the goals and at a distance from the field.

**PLAY-AREA**—The most efficient Benjamin Combination porcelain enamel and Alzak aluminum floodlight for brightness for lighting up every square foot of outdoor area.

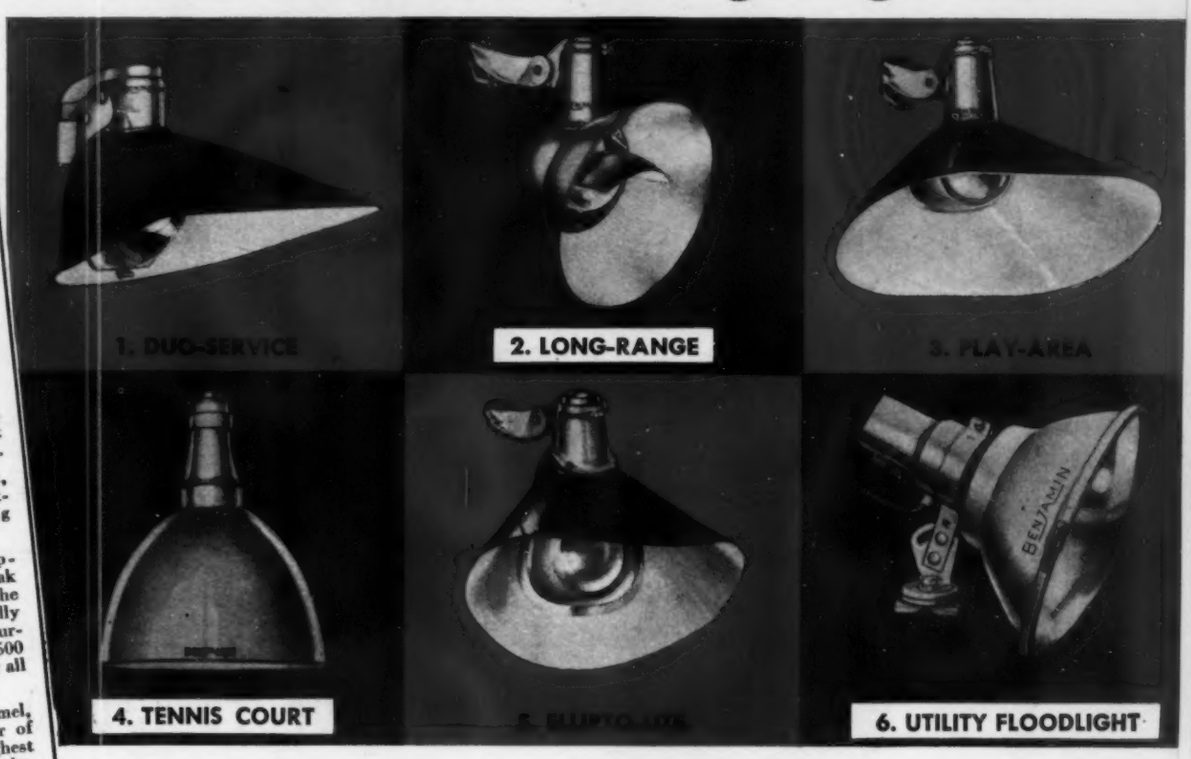
**TENNIS COURT**—A specially designed Alzak aluminum lighting unit for overhead lighting of tennis courts.

**FLUPTO-LITE**—A highly efficient, low-priced, durable floodlight for football, softball, playground, parking areas, etc.

**UTILITY FLOODLIGHT**—An exceptionally inexpensive closed type Alzak aluminum floodlight with most of the outstanding quality features usually found only in costlier equipment. Furnished in sizes for 200 watts, 300-500 watts and 750-1000 watts lamps for all types of floodlighting.

**COLUMN-LITE**—A porcelain enamel, Weatherproof Pole Top Reflector of distinguished appearance and highest developed lighting efficiency for lighting pump islands, railway platforms, safety islands, parkways, etc.

**COLUMN-LITE WITH UTILITY FLOODLIGHT**—An effective and economical means of adding to the light on the station building and pump island.






*MORE floodlighting jobs*: because with Benjamin's complete line you can easily show your customers how and why you can give them better floodlighting for their money. There is a Benjamin unit for the specific requirement of every type of outdoor floodlighting job. *More floodlighting jobs:* because Benjamin's engineering data makes selection of the proper units easy and assures best results from the installation.

*More floodlighting jobs:* because when you have a really out-of-the-ordinary floodlighting job, something which cannot be solved by the standard data now available, you can submit the facts of your problem to the Benjamin Engineering Department. Blueprints and specific recommendations will be prepared without cost or obligation.

*More floodlighting jobs:* because through Benjamin advertising and sales-promotion activities, operators and owners of service stations throughout the country are being told about the sales-making and money-saving Benjamin Duo-Service Floodlight. Owners and managers of baseball and softball clubs, superintendents, principals and coaches of high schools and all others interested in floodlighting of recreation fields, are likewise being told about Benjamin Floodlighting and how it increases attendance and gate receipts.

No wonder contractors using Benjamin equipment are being given the service station lighting jobs—the sports lighting jobs—the swimming pool and park jobs—and the industrial floodlighting jobs. Mail coupon today!

## BENJAMIN FLOODLIGHTING EQUIPMENT

***Distributed Exclusively Through Electrical Wholesalers***

**HANDY POCKET MANUAL**


On all Benjamin Floodlighting Equipment as well as on the complete Benjamin line will be gladly sent to all who

MAIL COUPON

Benjamin Electric Mfg. Co., Des Plaines, Ill.

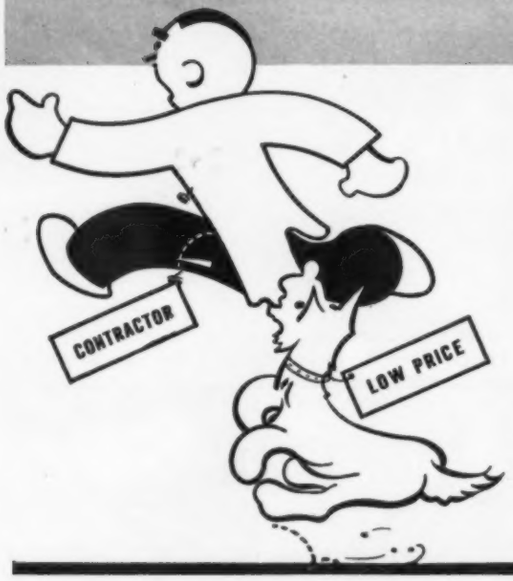
Please send me without cost or obligation your latest pocket manual No. 26 described on this page.

*Name*.....

*Address*.....

*City*..... *State*.....

# CAN YOU MAKE MONEY PUTTING IN THE LOWEST BID?




Too often the jobs let on the lowest bid are the most expensive in the long run. They do neither the customer nor the contractor justice. The customer pays in maintenance and replacement — the contractor loses his shirt . . . and his customer.

The real cream of the contracting business goes to the contractor who knows and tells his customers that money saving features cost them less in the long run. Note these features in the Westinghouse Packaged Control line — features that help take you out of low-priced competition.


## Westinghouse Nofuze Circuit Breaker

## SAVES UP TO $3000 A YEAR

Every motor circuit in a large railroad shop is now Nofuze protected. Savings on cost of replacement fuses alone total more than $400 a year — plus many times more than this in the cost of idle men and machines due to fuse outages.

•

"We used to carry a pocketful of fuses around with us" reports one Illinois manufacturer. "Machines were continually stopping, men were idle until fuses were replaced." The cost of these delays is eliminated with NOFUZE protection.

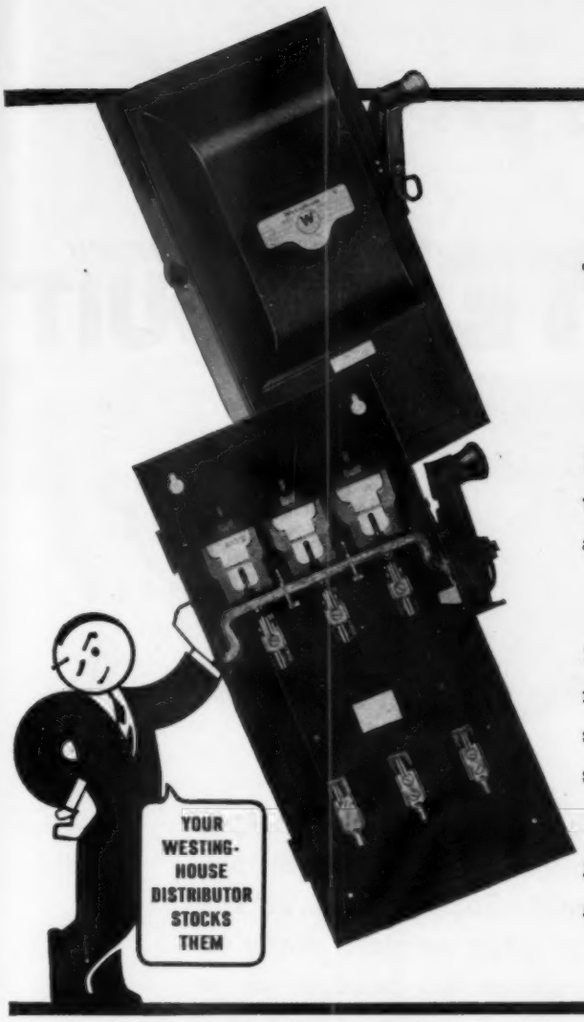
•

A clay plant in Illinois reports savings of $18.00 a day — over $3000 a year . . . similarly from all over the country, manufacturers report savings.

**Recommend Nofuze Circuit Breakers to your customers bothered with fuse outages and make them your customers—permanently.**

# Westinghouse

W WESTINGHOUSE ELECTRIC




## Westinghouse Safety Switches

## THREE EXTRAS THAT CUT OPERATING COSTS

1. The diamond pointed jaw and extended blade confine the arc to non-current carrying areas, leaving contact areas clean and free from beading.

•

2. One piece copper parts make fewer connecting points, mean less heat loss, less waste of power. Westinghouse switches have fewer connecting points than any other switch.

•

3. In 575 and 600 volt ratings, "De-ion" grids — quench arcs immediately, prevent flashovers, prolong contact life.

## Westinghouse Combination Linestarter

## 1 PACKAGED UNIT DOES 4 JOBS

Costs less to install. Saves wire, conduit, labor. The Westinghouse Combination Linestarter combines these four jobs in one compact package;

1. **Magnetic Motor Starter.**
2. **Manual Disconnect Switch.**
3. **Motor Overload Protection.**
4. **Nofuze Circuit Breaker.**

J-20838

## New "De-ion" Motor Watchman

## SAVES REPAIR BILLS...

- Automatically cuts the motor from the line before overload can damage windings.
- Westinghouse bi-metal disc gives positive, certain protection.
- Toggle switch indicates whether starter is on, off or tripped.
- "De-ion" arc quenchers prevent flashovers... prolong contact life.

Call your nearest Westinghouse distributor for sizes, types, prices. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

# Packaged Control

# electrical contracting

*With which is consolidated The Electragist and Electrical Record*
*Established* 1901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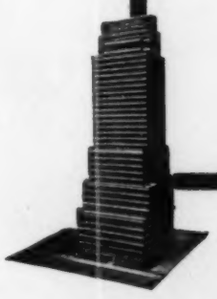
MAY, 1939



## *Departments*







A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.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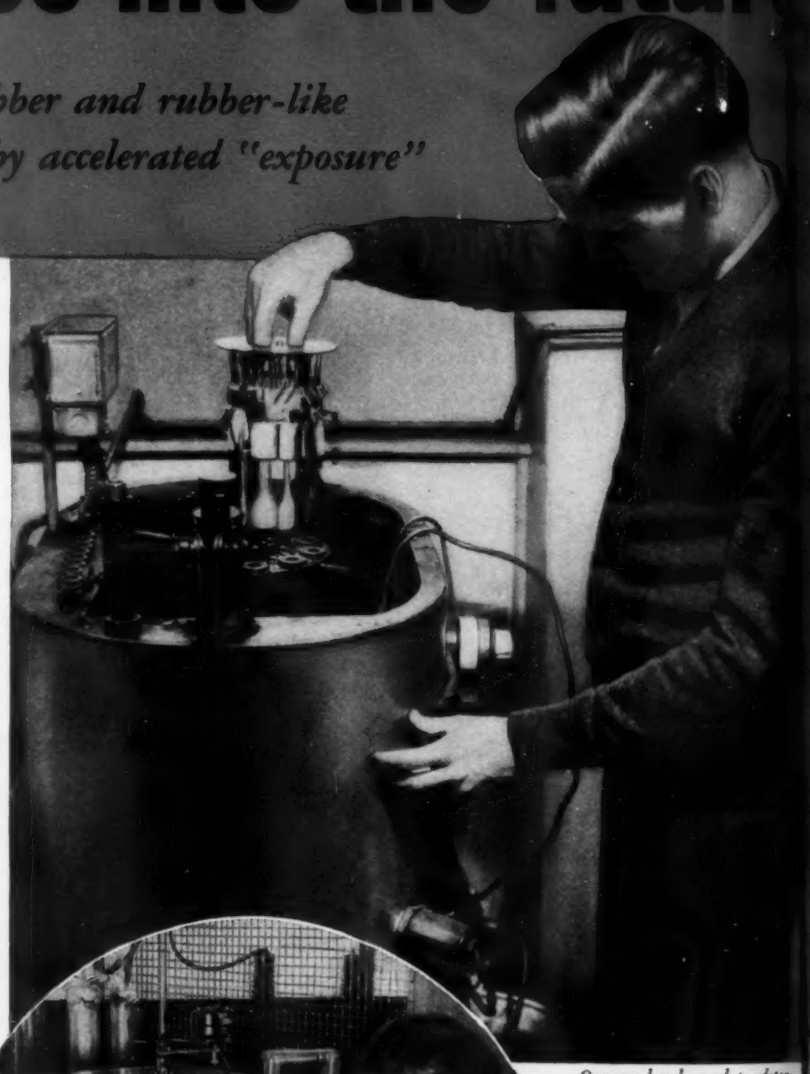
Cable address: "McGrawhill, New York." Member A.B.P. Member A.B.C.

**NEWS for the power industry from Anaconda Engineers**

# No crystal-gazing, but we DO see into the future

*Aging qualities of rubber and rubber-like insulations are measured by accelerated "exposure"*



AN elaborate system of tests has been built up at Anaconda laboratories in order that cable insulations may be subjected to "accelerated years" of service and exposure.

By speeding up the conditions of service under which cables must perform, we predetermine the durability of new insulations and constructions. By studying the results, we are able now to improve upon present types and offer the industry cables that are definitely more resistant to severe conditions, without waiting for the long years of equivalent service life to get the answer. Each year, in Anaconda laboratories, hundreds of new compounds are manufactured and subjected to these and other severe accelerated tests. Out of the many insulations tested each year, only a few are accepted as worthy of the Anaconda name.

Such painstaking search is indicative of the endeavor of Anaconda engineers to build long life and outstanding performance into Anaconda cables. The benefits of this research are being passed on to industry in the form of more enduring constructions.

## Put your problem up to Anaconda

When you have a cable problem of any kind, put the matter up to Anaconda engineers. For your day-to-day requirements also, you will find that the name "Anaconda" on cables means the utmost in service.

*Oxygen bomb used to determine aging qualities of rubber insulation when subjected to oxygen pressure and heat.*

ANACONDA

*Determining the effect of ozone on high-voltage rubber and synthetic insulations.*

*Visit the Copper & Brass Industry Exhibit in the Metals Building, New York World's Fair—1939.*

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USE MODERN IMPROVED **Anaconda Wire & Cable**

ANACONDA WIRE & CABLE COMPANY • General Offices: 25 Broadway, New York City • Chicago Office: 20 North Wacker Drive

*A subsidiary of Anaconda Copper Mining Company • Sales offices in principal cities*

electrical contracting

MAY, 1939

# Beyond the Crutch

THE POWER COMPANY DRIVE for cheaper wiring is kicking up considerable fuss in the industry. They are holding local meetings across the country to promote eight changes in the Code. To many contractors and inspectors, this is a dangerous attack on our safety standards.

THE TWENTY YEAR CONTROVERSY over cheaper wiring seems to be coming to a head. For the sub-committees of NFPA indicate that thin insulation wire, bare neutral and CNX will be recommended for approval in December. But even if these changes should be accepted, will the real issue be settled?

WE FOUGHT AND BLED over dear old Romex for a long while—and what happened? It quietly found its economic place in the market. It is now merely another good material. It has not hurt contractors nor labor nor visibly helped to sell more outlets.

THE RESULTS WILL PROBABLY BE THE SAME, if thin insulation and bare neutral are voted safe and approved. Each will find its place. But they will not in themselves popularize adequate wiring. They will not step up and do our selling for us.

THERE IS NO PUBLIC CLAMOR for more wiring. We must not forget that. If it costs a lot less to re-wire larger buildings with thin insulation—why that will help a lot. If it costs a little less to wire houses with CNX—why, that will help a little. But our selling job will stare us in the face still—just as it did when we got Romex.

THERE IS ONLY ONE REAL ISSUE involved in any Code change—Is it safe? If it is—open the doors! If not—bar it out! For we must have progress in the art. We must not oppose change, just because it may be inconvenient or unwelcome to us. We know that any change that does not bring sound advantages will not go far anyway.

AND HOW DO WE PROVE A NEW MATERIAL IS SAFE? Not by arguments. We have fought over opinions too long. It is an engineering problem—this matter of safety. Meanwhile, we still confront our inescapable selling job—and we should waste no time waiting for new crutches, useful as they may be. We have good legs right now.

Paul Shuchman

# THIS IS WHAT WE MEAN BY AN "EXPERIENCED MAN"

## He's been meeting electrical contractors' needs for 24 years

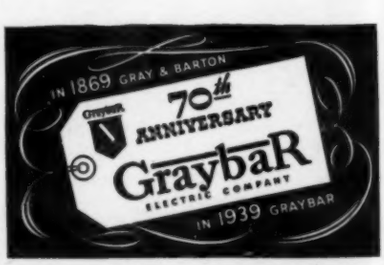
The average experience of Graybar managers, service managers, and supply department managers is 24.13 years.

These men have been studying the needs of electrical contractors—on an average—since 1915. These Graybar men *know*—from experience—just what electrical products you are likely to need for any and all types of construction—large or small—home, office, or factory.

The long experience of Graybar men results in frequent savings of time, energy, and money for our contractor customers. Whenever we have an opportunity to become better acquainted with the specific needs of individual customers, even more conveniences and savings are made possible. Our entire organization is geared to properly meet the needs of Electrical Contractors.

Graybar stands back of every sale it makes. It provides a nearby, wisely-stocked source of 60,000 electrical items. It brings you the electrical items by speedy "action service"—either at convenient pick-up counters or by truck delivery.

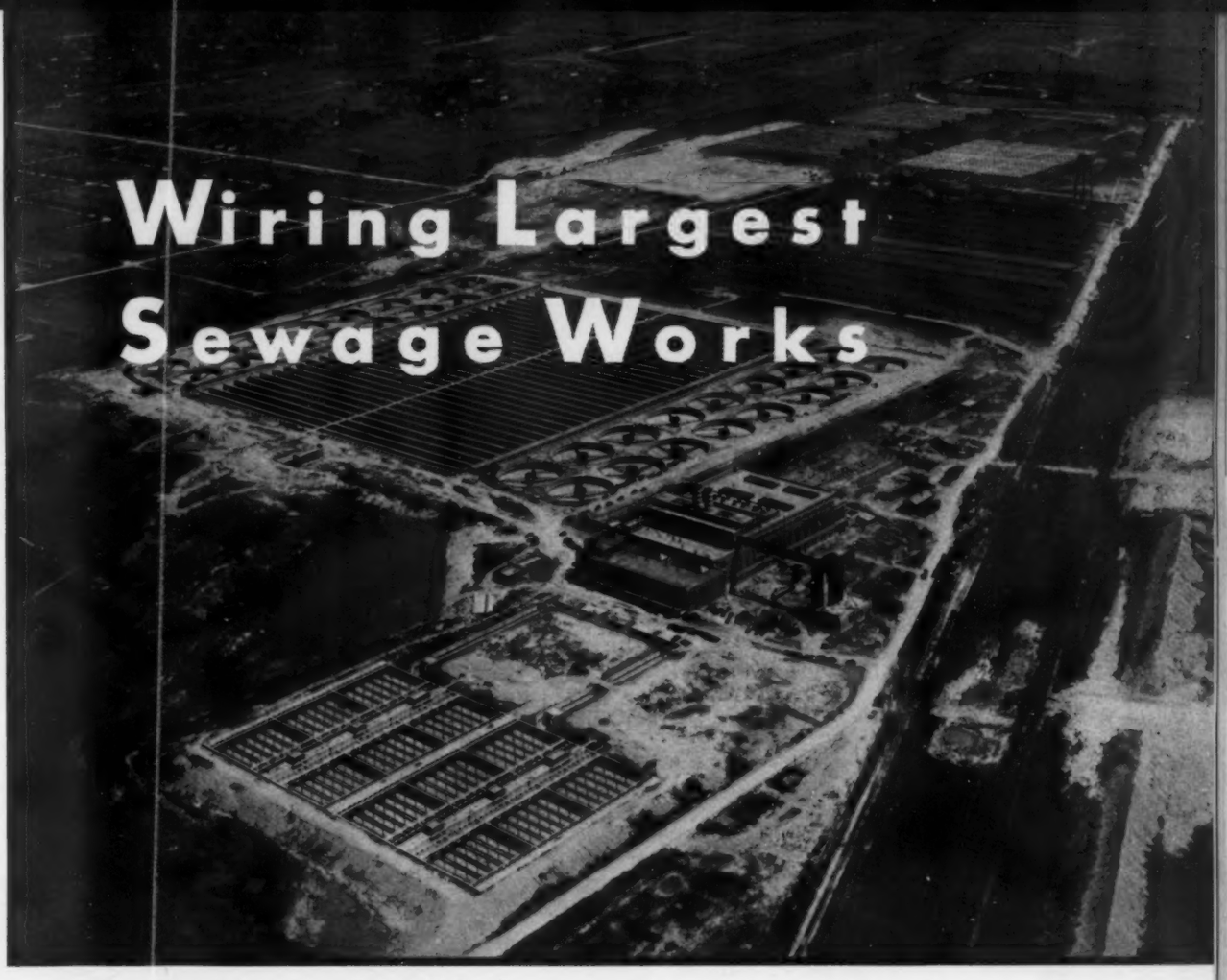
All these extras are part of the *plus value* you get with every dollar you spend with Graybar. And you deal with a responsible, financially-strong organization whose *own* experience goes back seventy years to 1869. Try Graybar when you buy!




FUSES • WIRE AND CONDUIT • TAPE • WIRING DEVICES • LIGHTING • MOTORS

OFFICES IN 83 PRINCIPAL CITIES • EXECUTIVE OFFICES, GRAYBAR BUILDING, NEW YORK, N. Y.

# Wiring Largest Sewage Works



**Chicago's Southwest Sewage Treatment Works, the world's largest sewage treatment plant, will be placed in operation early this summer. The electric wiring and equipment in the main sludge disposal building has many outstanding features of timely interest to electrical men everywhere.**

**By W. T. Stuart**

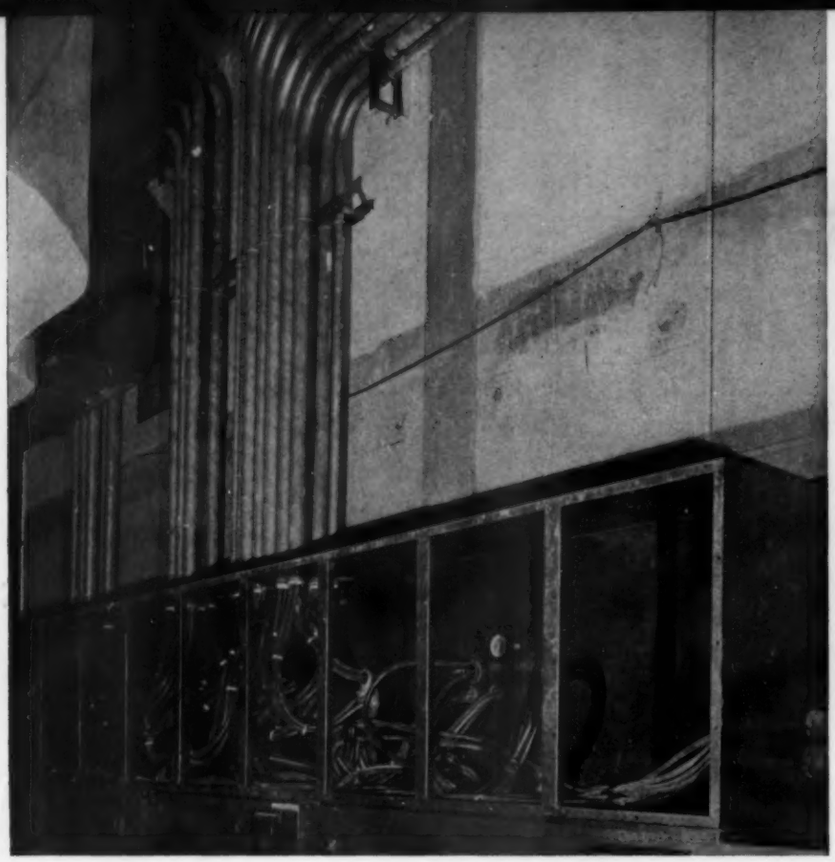
HANDLING the waste products of large population centers like the widespread southwestern district of metropolitan Chicago is an intricate problem in drainage and chemistry. This tremendous civic job is carried out by a separate governmental unit known as the Sanitary District of Chicago. The importance of this organization to public health is widely recognized, the methods of handling city sewage is also well known, however, few people recognize the part played by electric power and control in carrying on these operations. The new southwest sewage treatment works, a unit of the Chicago Sanitary District, provides an example of the complex coordinated control necessary to handle huge volumes of waste products with the human element reduced to dial watching.

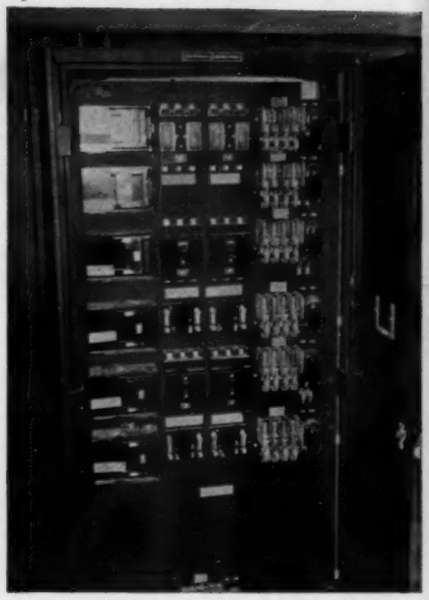
The sludge handling building, which houses most of the processes involving electrical control, takes care of a unique process whereby the solids extracted from the sewage system are dried. These extractions are fed into huge incinerators to provide steam for operating huge blower pumps and generators, which in turn provide energy for auxiliary equipment. A portion of this electrical by-product of sewage disposal is sold to the city of Chicago for street lighting and city use.

This plant, designed to handle 400,000,000 gallons per day, from a population of 2,500,000, was designed by the engineering staff of the Chicago Sanitary District, under William H. Trinkaus, chief engineer. The electrical work was under J. T. Hawley, chief electrical engineer, and R. R. Pinkerton, chief electrical designer. The major electrical equipment contract was handled by the General Electric Co. and installed by the Central States Electric Co., electrical contractors, of Chicago.

The plant provides its own electricity from two 5,000 kva turbine generator sets, delivering energy at 6.6 kv to the high tension bus. A tie-line connects the Southwest plant with other plants operated by the Sanitary District. High voltage switching is handled by remote control from a pilot board in the incinerator plant. Adjoining the control room is the main electrical equipment room containing power and lighting transformers, generator and synchronous motor exciters, direct current generators and floating storage battery for station operations and the main power and lighting switchboard.

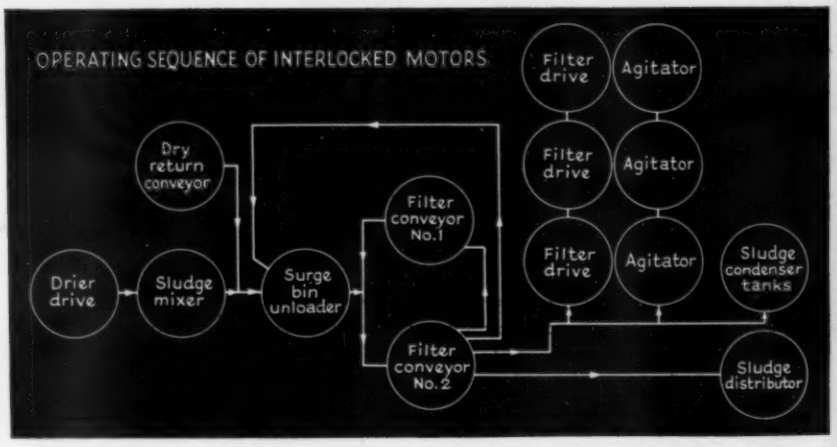
Duplicate sets of three 1,667 kva transformers reduce the voltage from 6600 to 440 volts for power distribution. The main secondary 3 phase buses are pairs of nine inch copper channels suspended in an aluminum supporting structure into the main power switch structure. Framework, transformer secondary compartments and the enclosure surrounding the bus work along the top of the board, are entirely constructed of non-magnetic materials. The duplicate





TYPICAL POWER *panel. Each circuit is equipped with a pull-out disconnect, circuit breaker type switch and remotely operated magnetic contactor. Equipment shown is all back connected.*

MASSED RUNS *of heavy cables and conduits required adequate pull box designs like this one, to give plenty of working space.*




INTERLOCK CONTROL *diagram of a typical process series. Opening of any motor circuit cuts out all preceding equipment.*

sets of transformers are fed into separate six pole breakers which permit either or both sets of transformers to be connected to the switchboard main bus.

Two banks of three 100 kva transformers provide energy for the 220-110 volt lighting system. The lighting transformers are energized from the 440 volt power system. The 300 kva lighting transformer banks are in duplicate and the three single phase transformers in each bank energize three separate sets of buses.

A 30 kw motor-generator battery charging set and three 25 kw motor generator sets for alternator field excitation, including one spare, are also operated from the 440 volt secondary bus. A portion of the lighting system for emergency use is fed from the 115 volt direct current operating system.

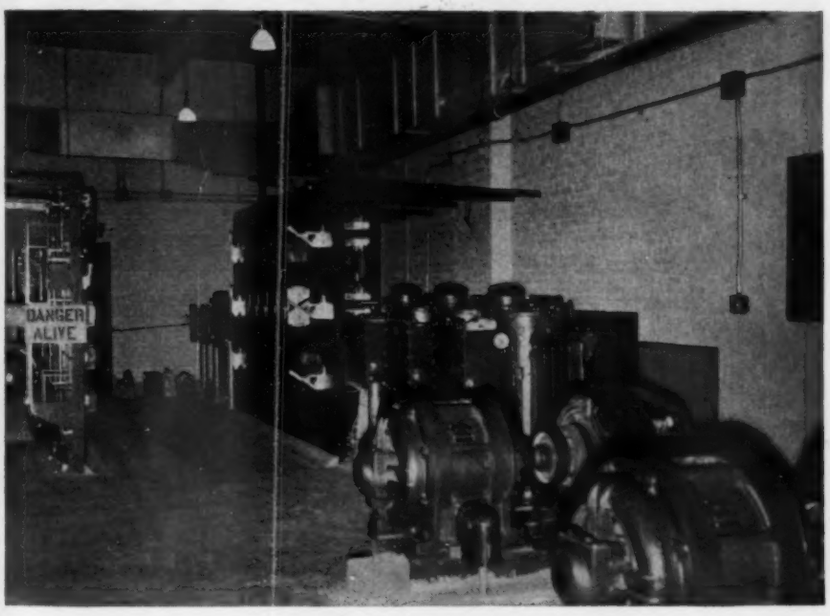
The wiring system is run, in general, in galvanized conduit in the slabs or exposed on hangers. Approximately 30,000 ft. of ¾ in., 35,000 ft. of 1-in., and 20,000 ft. of 1¼ in. conduit was used on the job. Three-quarter inch was the minimum size. For the secondary power and lighting circuits, water and heat resistant, rubber covered wire, consisting of 1000 volt, 35 per cent performite rubber covered wire, with heavy braid, was used generally throughout the job, because of the prevailing damp conditions at some locations and high temperatures at others. The job required approximately 220,000 ft. of number 12 single conductor, double rubber covered wire.

A special splicing procedure is used on this type of wiring that differs considerably from the ordinary job. After the wire is skinned and twisted, it is wrapped with 3/16 in. tinned copper ribbon which is filled with molten solder. The wires are sealed with rubber cement and tied together with armature twine on the insulated portion. Performite tape is then applied, roughened and covered with cement. Neoprene tape is then applied over all, then friction tape, which is, in turn, covered with a protective paint.

Because much of the complex machinery in the plant is exposed to operation by relatively inexperienced help, an intricate system of motor interlock and protective devices was introduced in the power circuits to guard both men and equipment from accidental or improper operation. A typical interlocking diagram is shown. In each step of the sludge handling process, involving some 15 motors per operating unit, the motors are so interlocked that in the event of a failure of any one, all preceding motors in the cycle of operation are automatically cut out. Push button stations for the control of interlocked equipment are arranged with cylinder locks to permit the stop button to be locked in the open position or, in some instances, to prevent the start button contacts from being closed.


ALUMINUM STRUCTURE *supports 440 bus bar secondaries between power transformers and switchboard (above).*

POWER SWITCHBOARD *enclosing the bus and circuit breakers for the 440 volt circuits is divided into two units, each 25 ft. long. Feeder compartments are isolated and equipped with roll out type breakers.*




MAIN LIGHTING *switchboard flanked by duplicate sets of 100 kva transformers. The motor generator set in the foreground is one of the exciter units.*

Motors and control equipment throughout the plant are protected, in all possible ways, from the effects of excessive moisture or corrosion. Splash-proof and totally enclosed motors are the rule and also weather-proof motor starting switches, contactors, push button stations or other control devices are used whenever such equipment is mounted at or near the sludge handling machinery.

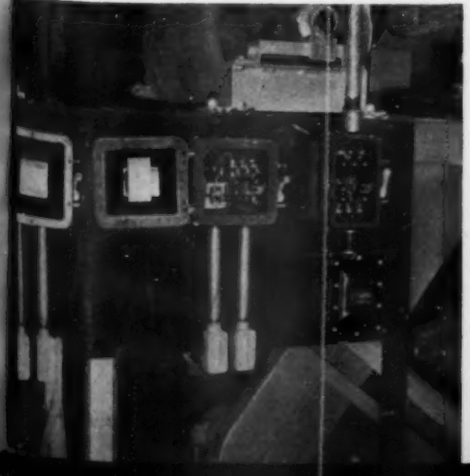
Similarly, wiring devices, switches, plug receptacles and junction boxes are of water-proof, gasketed construction. A complete, separate system of grounding all power equipment is carried through the building.

All motors, controls and panel supports and all electrical equipment is connected to the grounding system independent of the conduit runs. The ground system consists of $2 \times \frac{1}{4}$ in. copper bus bar, $1 \times \frac{1}{4}$ in. copper bus bar, and 300,000 cm bare wire connected to a system of buried ground cones. Where the grounding conductors are carried on the surface they are uninsulated but covered with a protective paint.

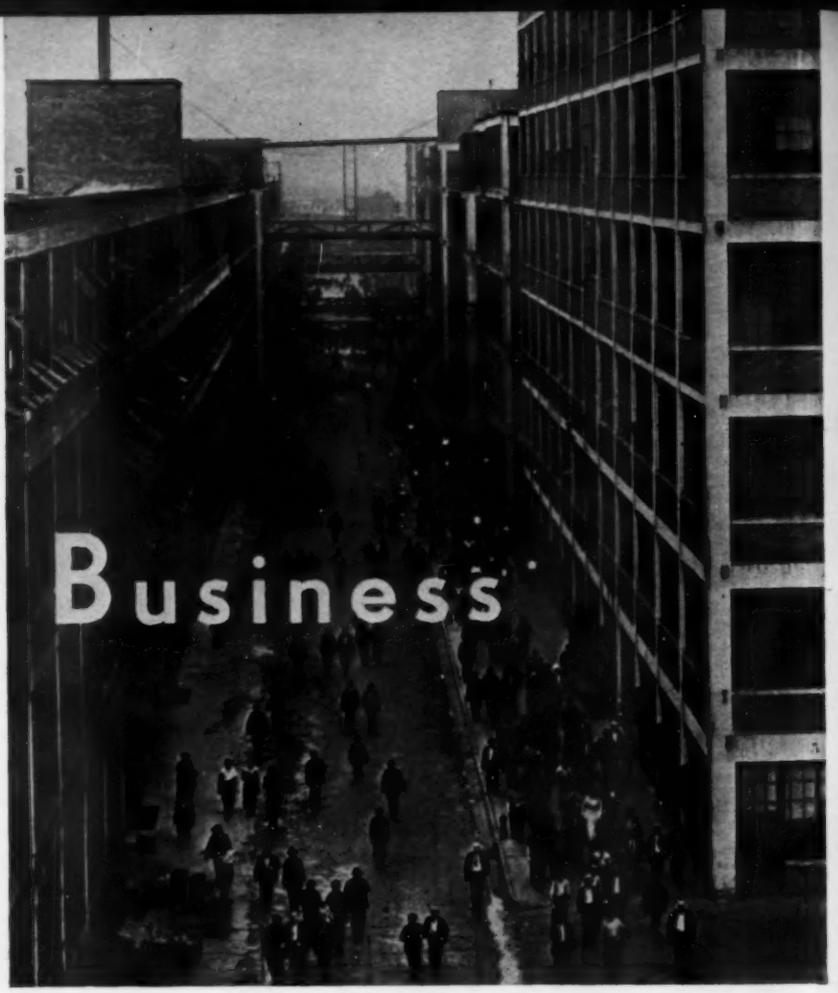
Dust or flyash in the furnace gases are removed before entering the stack by an electrical precipitator. The system consists essentially of high tension transformers and mechanical rectifiers delivering high potential direct current to charging electrodes. This system is guarded against accidental operation by a series of locks so that the switchboard cannot be operated until all enclosures surrounding high tension equipment are closed and locked.

Because of the prevalence of corrosive fumes and dampness, the entire electrical system in this sludge disposal building presented many problems of design and installation not only for the protection of the valuable machinery and the wiring system, but to safeguard against any possibility of shock hazards. With adequate weather-proofing, fool-proof enclosures and guards, and careful planning on each detail of installation, the Chicago Sanitary District and the electrical contractors have provided an electrical job of outstanding merit.

GASKETED COVERS *and heavy weather-proof cases and conduit fittings protect control apparatus mounted adjacent to sludge handling conveyors.*



# BIG Factory Business



**By Earl Whitehorne**

**The industrial contractor has eight services to sell to factory management—Together they can far outweigh the obstacle of high labor costs where it exists.**

A LARGE eastern electrical contractor wrote to me the other day. He was commenting on the article "Four Cities Tell A Tale", published in these pages in January. He raised the question that bedevils contractors in many industrial cities in the land—how to sell big factories when the union wage is higher than that paid to the plant electrical staff?

Well, the problem gets right down to what the contractor has to offer. If a factory has some wiring or some major repair work to be done, and the contractor must charge a higher price for precisely the same service that the plant electrical staff will provide, then he is licked. But if he can offer for that price, other and additional services and benefits of interest to industrial management, then he is not licked.

As a matter of fact that is exactly what he does offer. To boil it down, he offers eight specific services—in addition to labor and materials—

1. He provides all the tools and equipment required for the job, so the factory needs make no investment for temporary use.
2. He has the necessary labor ready and trained for the job, so the plant staff is not called on to hire extra men.
3. He purchases all the materials, so the factory purchasing department does not have to assume the burden of the buying and be stuck with waste material, leftovers and ill bought equipment.
4. He furnishes all the supervision, so the factory's own engineers and executives are relieved of this extra and unaccustomed burden.
5. He brings to the job a broader experience in varied industrial construction or motor repair, than the factory's own electrical staff can be expected to provide, since its activities and observations are naturally restricted to the types of equipment used in its own factory.
6. He brings to the planning of the job, a broader knowledge of the available equipment best suited for the needs of the job, so can make a more confident and dependable selection.
7. He relieves the customer of all responsibility, for the proper performance of the job when it is done. For he stands behind all materials, equipment and workmanship. He must do the job right or make good for it. And factory management would rather not place this responsibility on an employee and have to stand the cost of possible mistakes.
8. He relieves the factory maintenance staff of this unusual extra work that inevitably upsets its normal efficient operating schedule. Its regular work is not interfered with. Its staff is not demoralized.

So the industrial electrical contractor and the motor shop should supplement the plant staff in the large factory, by taking the unexpected and unusual work and getting it done. Of course, where this contractor or motor shop employs union labor at a higher scale than the wage paid to the plant electricians—if they are not union men—there will be a margin of added cost. But these eight other services will be far more important considerations, if they are properly explained and sold.

In some cases, the factory may insist on buying its own materials and equipment. Under these circumstances, the contractor should make a definite charge for these other services rendered. They should not be sold for the mere margin on labor.

# Making Transformers SAFER

**Already several thousand transformers, containing "a liquid that will not burn" are in use. A bit of background on this development.**

**By F. G. Stebbins**
*General Electric Co., Pittsfield, Mass.*

**Ten Advantages of Transformers, filled with "a liquid that will not burn".**

1. Vaults not needed—space saved.
2. Transformers may be located nearer the load.
3. Secondary cable runs shortened.
4. Simplifies construction in hazardous locations.
5. Lower maintenance costs.
6. Moisture stays on top of liquid and does not settle into windings.
7. Reduction of fire hazard.
8. Insurance rates reduced in many cases.
9. Longer operating life.
10. Saves money on total installed cost.

DURING the early years of transformer development an important step was the use of mineral oil as an insulating and cooling medium. At first many skeptics predicted disaster because of the inflammability of oil and because of the explosiveness of the vapors set up by the action of electric arcs under oil. But the use of fireproof transformer vaults made such installations reasonably safe.

But mineral oil, though being a good cooling and insulating medium for transformers, lacks three qualities—chemical stability, non-inflammability and non-explosiveness of its derived gases. Under heat, oil oxidizes, forms acids and sludges and therefore, it must be reconditioned periodically by filtering.

So men in the electrical industry dreamed for forty years of a synthetic liquid dielectric that would have all of the qualities of an ideal cooling and insulating medium. And finally research produced it. General Electric sells a liquid for this purpose made by blending trichlorbenzene and chlorinated diphenyl and trade marked "Pyranol."

Recognizing this development the 1935 National Electrical Code gave approval to transformers "containing a liquid that will not burn" to be installed in buildings without the use of fireproof vaults. Further recognition was given when the 1937 Code simplified the installation requirements. Under Section 4503, such transformers can be installed without any of the restrictions required of equipment filled with a liquid that will burn. Moreover Section 4504-C provides for the installation of 15,000-volt transformers containing a liquid that will not burn, in buildings without a vault.

In hazardous locations, Article 500 of the Code makes it unnecessary to build a re-enforced concrete vault to enclose equipment filled with a liquid that will not burn. For Class I locations it is only necessary, with Pyranol, to exclude the entrance of hazardous vapors by a simple vault of fire-resistive construction, with ample ventilation to outside air. For Class II, III and IV locations, involving hazardous dust, an oil-filled transformer must be in a re-enforced concrete vault, dust-tight and of fireproof construction. If a transformer with a non-inflammable liquid is used in this area, the vault must be dust-tight, but need only be of fire-resisting material.

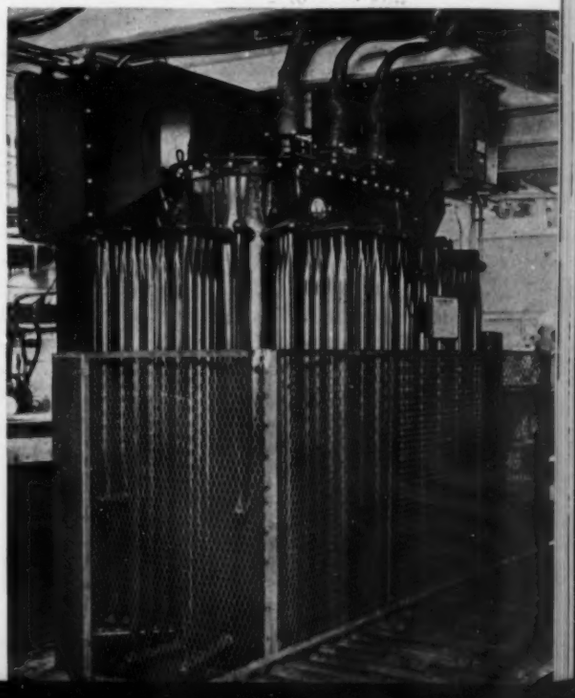
The Code has also specific requirements for providing gas pressure relief vents. Where such a transformer is located in a poorly ventilated place two means are available for disposing of gases if failure of a transformer occurs: A vent pipe can be installed, terminating outside of the building, or in a chimney or flue. If a vent pipe is not feasible, a simple gas absorber can be bolted directly to the transformer over the relief diaphragm in the cover.

The absorber and the vent pipe are not necessary for the successful operation of a Pyranol transformer. If the room in which the transformer is located is well ventilated to outside air or to a chimney or flue, it may not be considered necessary to use these devices on the transformer itself.

Although the majority of the 1800 Pyranol transformers installed so far are located indoors, a number of industrial plants and power companies have found it profitable to install them outdoors.

The reason lies in reduced installation costs, more centralized transformer installations at load centers and maintenance economies. Expensive fireproof vaults have been eliminated and may mean savings of from 20 to 60 per cent in the installed cost for a new building installation.

In a crowded industrial plant it is generally impossible to locate a fireproof transformer vault near the load centers. With oil-filled transformers, it is therefore impracticable to avoid expensive secondary cable runs, to improve regulation and reduce losses. This can be done with fireproof transformers, because they occupy the minimum of floor space, or they may be placed between lally columns, or on a platform above the production floor.



NEAR THE LOAD—*This 1000 kva, 13800/575-volt Pyranol transformer saved feeder copper and vault costs by its central location.*

# WIRING— our Bottleneck

**For many years the power companies have been urging the use of less expensive wiring materials. A year or so ago the "Edison Association" and the "EEI" launched a more active promotion of the idea, recommending eight changes in the Code. Mr. Gushee heads this movement and meetings have been held in about a hundred cities. We have asked him to state his objectives in this campaign.**

**By Edward T. Gushee**
*Vice President, Detroit Edison Company*

TEN years ago the electric range was stymied by four factors: first cost, bad operating characteristics, installation costs, and rates. Through a number of developments, ranges are selling today for roughly 50 percent of the price prevailing in the 20's. Operating efficiences in speed and consumption have been bettered by some one to three hundred percent. The national rate schedule, in general, is very competitive with other forms of fuel. And the installation cost has been reduced better than 50 percent.

In 1928 I installed my first electric range. I lived in a two family house. The installation cost me $110.00. A year later I moved to another house. The installation cost of the range, at that location, was something of the order of $60.00. Two years later, I moved again, and the new installation cost was then around $35.00. Now the present cost in this territory is about $25.00.

Today there are 70,000 ranges on Detroit Edison lines. Sales of ranges last year were approximately 10,000. A large number of ranges are also being sold in many other parts of the country. Now, mind you, I don't say that any *one* of the factors which I have mentioned is solely responsible for the vastly increased number of labor hours and the increase in profit possibilities to every part of our industry. But the increased sale and use of this product has very definitely been due to the fact that all of these costs have been brought down within reach of an ever-increasing number of people.

About three years ago Mr. Alex Dow, president of our company, asked me to interest myself in wiring and the Code. I knew literally nothing about the subject. Of course, I found immediately that the subject was very complex in its technical aspects, that there were a large number of different interests involved, and that everyone had vehement opinions about the entire matter. After I had digested some of the mass of accumulated written data, I made up my mind that the most important thing to do was to visit with representatives of these different groups and find out how they felt about it. This I did.

I talked with other utility men, with manufacturers, inspectors, insurance men, jobbers, contractors and representatives of labor. Two things I found in common among all groups: each had a lively interest in the subject, and each called all the others bad names. There was a complete lack of understanding, sometimes even within a given group and certainly between groups. Yet, the more I studied the problem, the more it seemed to me that the interests of every group concerned were identical and tied in directly with the paramount interest of the public.

Broadly, and without detailed technical discussion, the problem that faces us all, in relation to wiring, is the making available to new and old houses and buildings of every sort more capacity at less unit cost with equal or greater safety. A step in that direction is embodied in the program suggested by the Edison Institute as amendments to the Code.

This embraces eight recommendations already widely published, which H. J. Morton, of our company, is now explaining to local meetings of electrical men throughout the country, representing the Edison Electric Institute. Also a committee headed by E. A. Brand, of Niagara and Eastern Power Company, is now busily engaged in preparing a series of pamphlets explaining these proposals in detail, both as to their purpose and application.

These recommendations are made in the belief that each of these provisions will contribute something toward the reduction of the cost of wiring. And as an employee of a utility company, I am sold on this program. So is my company and so are an ever-increasing number of utilities. Naturally, working for a utility, it was the utility dollars with which I was at first concerned.

For example, we receive so many complaints from customers who can't satisfactorily use their appliances and electrical equipment that The Detroit Edison Company maintains a crew of 206 troublemen who investigate blown fuses. Last year they made 306,000 calls on customers' premises, and a large percentage of these calls were interruptions in service due to undersized copper capacity.

Moreover, there is constant pressure to lower the cost of the product which we sell, and the only way that can be done is to increase the sale—to get people to use more of it. Here we have been smack up against a merchandising situation which has been impeded be-

cause of the first cost involved in changing the wiring.

Again, we all know of many office buildings in this town and many houses where rewiring costs are standing in the way of more satisfactory illumination. And when we, who are interested in the wiring problem, refer to cost, it naturally divides itself in our minds into two parts. (1) An actual reduction of cost in the rewiring of old buildings, whether office structures or houses, since present costs do not get the work. (2) The reduction of unit costs *only* for wiring of new projects, coupled with active sales promotion for more units. Together these will produce vastly greater gross business for all. But how will such a program affect the other branches of the industry?

Electrical manufacturers will benefit in many ways, even though there be changes in materials which tend to reduce unit costs. For it is even possible that some new materials will sell at a price higher than materials which they replace. Moreover, as far as I know, no one is advocating a departure from broad national standards.

Nor should we forget that the electrical wiring end of this business is only one part of the manufacturers' market. It is, however, truly the bottleneck through which we provide means to use millions upon millions of dollars' worth of appliances, for which in turn must be invested other millions and millions of dollars in generators, transformers, turbines and all manner of electrical materials. At the end of this chain is the present and entirely too small market for wiring materials. It is not necessary to point out that unless sufficient wiring can be sold, the connecting link between generation and utilization equipment is not provided.

Jobbers, in turn, will profit for the same reasons that manufacturers will profit. When more materials are sold for house wiring, when old commercial or office buildings and factories are rewired, the jobbers will stand directly in the path of that business. And what has been said about manufacturers and jobbers is equally true of the contractors.

There have been some 70,000 ranges installed in the Detroit territory. This has involved contractor business totaling nearly $2,000,000. The installation of 194,000 outdoor meter boxes in Detroit has accounted for some $1,500,000 to this trade. These two items alone—ranges and outdoor meter boxes—have definitely increased the amount of work for contractors, for labor, for manufacturers, and for jobbers. It would have been impossible to do this work without the cooperation of all concerned in lowering unit costs thereof. The customer work simply would not have been there. And the company dollars for outdoor meter box installations would not have been there.

Engineers assure me that wire insulation can be materially reduced in thickness and yet provide greater safety than we have ever been able to obtain. Can you contractors visualize how much additional business could be created immediately, if, by using these smaller diameter wires, many of the commercial buildings in our cities could be rewired at a cost that the owners of these buildings could afford to pay? This entirely new wiring market, not heretofore available, can be created while we are all waiting for more large buildings to be built.

Technical data is available to show that the amount of capacity in existing conduits in these commercial buildings could be increased two, three, or even four times, with greater safety than we now have—and without the necessity for having to tear buildings apart and completely redecorate in order to do so. This is only one of many possibilities if new ideas are accepted. It is only one of several important developments that have been suggested for the next revision of our codes and standards.

It is certain that if these changes in the Code are given due consideration, and the technical facts upon which they are based are thoroughly understood by everyone in the industry, the Code, and whatever other local ordinances need revision, would be changed immediately. This would permit you and me to get this business. For example—

About a year ago in a midwestern city one of the large 17-story buildings of a national concern needed complete rewiring. The local executives asked for bids. The estimate was about $200,000. Wham! No job—no work! But if this new wire could be used this job would be done.

And while this is all going on, the inspector's responsibilities will be simplified. For the public will be able to afford adequate wiring and hence can do without substandard materials which are not safe, and other temporary wiring expedients which are positively dangerous. And at the same time, if the manufacturer, the jobber, and the contractor profit by reason of increased business, it is clear that increased business will use more labor. The thing rolls up like a snow ball.

That's a rather general statement, but we have before us in this district specific examples of how labor has already benefitted from this sort of a program. In the range installation work in this territory, there have been over 240,000 labor hours provided, most of which would not have been used, except for the fact that an increased number of people were able to buy and install electric ranges due to decreased costs of the whole job. Incidentally, it is estimated that on ranges sold in this territory alone, over 500,000 man hours were provided in the manufacture of the ranges. And nowhere in this country, where range installation costs are above $40.00, are any large number being sold.

I do not minimize the difficulties in arriving at a complete understanding of the mutuality of interests of all parts of our industry. But I am convinced that we all stand to profit by the prompt adoption of more modern wiring methods. And I am convinced that with absolute regard to safety of life and property, the industry, if it will, can offer to the public, wiring methods at costs which are better within their reach.

## POWER COMPANY PROPOSALS

**The original recommendations of the power companies were stated by C. W. Kellogg, E.E.I. president, Electrical World, May 1938 as follows:**

1. **Provision for the general use of non-metallic sheathed cable of the covered neutral type, as a wiring system.**
2. **Provision for the use of duplex and multiple-conductor cables of covered neutral type in raceways of all classes.**
3. **Provision for bare neutral in conduit and electrical metallic tubing for general use.**
4. **Provision for the general use of thin-wall insulation.**
5. **Modification of the conduit area rule to permit in old installations utilization of the waste space for additional wire required by increased loads.**
6. **Recognition of service cable of the covered neutral type for general indoor use.**
7. **Removal of requirement for mandatory use of rigid conduit in theatres, elevators and hazardous locations and of metal-clad wiring in garages.**
8. **Deletion of rule requiring conduit to be shipped in 10-ft. lengths.**

**—Editor**

# LIGHT to lure a multitude

## TO THE NEW YORK WORLD'S FAIR GROUNDS

THE TOWER OF GLASS . . . and blue and white fluorescent lamps, concealed behind glass blocks, turn this imposing shaft into a glowing column of cool, refreshing light that conjures up a fantastic illusion of ice-cube architecture, that will delight the eye on hot summer nights—or any other evening.

TASSELS OF LIGHT climb in a spiral column on the Distribution Building. A curved luminous strip twists its way around the ceiling of the portico, throwing the brightly-colored murals into bold relief. Deep-blue fluorescent lamps, in fluted coves, create a high-light-and-shadow effect that is most appealing.

SIMPLE ARCHITECTURAL FEATURES of the Home Furnishings Building stand out in their full beauty at night as Bowling Green Plaza is filled with a golden glow. Indirect yellow light accentuates the stately lines of the building and is radiated into the street by rows of prismatic lenses—themselves unseen.

JEWEL LIGHTS form a decorative crown for Pierre Bourdelle's fresco mural on the drum of Food Building No. 2 where Constitution Mall meets Rainbow Avenue. Down Constitution Mall the burgundy walls of the building are steeped in the light of incandescent lamps with red cover lenses.

SCULPTURED FIGURES become shields for indirect light reflected by the wall. These two interesting lighting effects are found on the Metals Building. And at the right is the "glass fountain," a glass wall behind which fluorescent tubes form a pattern of blue and white.

TOWERING COLUMNS of light and sculpture, these Fire-Earth-and-Water Pylons employ concealed lamps to accentuate the essential simplicity of their architectural design. The tree in foreground is bathed in the concentrated bluish-green light of a mercury-capillary lamp unit embedded in the ground beneath it.

General Electric Photographs

# SELLING Instrument Service

**By Bernard Marks**
*Marks Electric Co., Chicago, Ill.*

QUALITY INSTRUMENTS *give the analyst the data upon which he bases his recommendations. Some of the instruments used in making industrial surveys, recording watt meter, voltmeter and power factor meter plus compact megger, tachometer and indicating instruments are the eyes, ears and fingers of the business.*

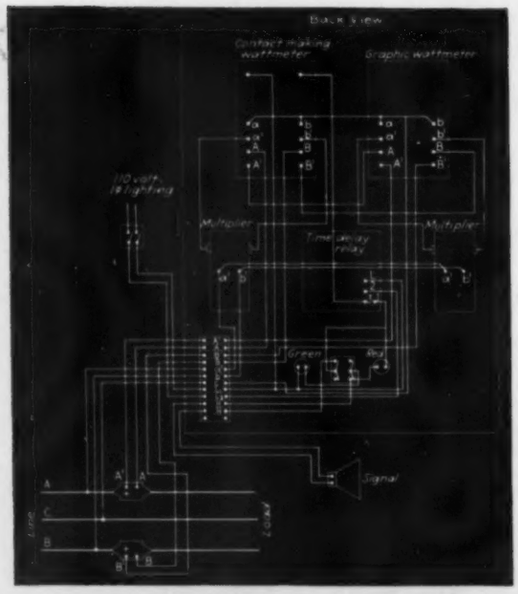
IN every large metropolitan area, for every plant with 25,000 to 30,000 hp. loads, well equipped maintenance departments and high grade engineering services, there are dozens of smaller industrial establishments that lack them. Yet they are just as much interested in electrical efficiency, power saving and shut-down insurance as the larger plants.

During the past year we have added a commercial electrical field test service to our business. We have equipped fully with graphic recording and indicating instruments for load tests and power surveys, insulation tests and speed tests. We have gone ahead with the idea of providing the smaller plants with the same type of high grade engineering service that the big industrials have found so valuable. A recently completed job for a customer who manufactures heavy rubber products is characteristic of the kind of commercial test work that we now give the customer. We believe it is a kind of service available from no other source.

ENGINEER *Bernard Marks takes the instrument data, studies plant operation conditions and works out the recommendations.*

**With a background of ten years experience in the electrical department of one of the country's largest steel plants, Bernard Marks brought to the Marks Electric Company, Chicago electrical contractors, an intimate knowledge of the kind of electrical service that industrial plants need today. Big plants with engineering staff and specialized maintenance forces can keep a watchful eye on power factor, maximum demand, motor to load balance and electrical efficiency. Such services, however, are not available to the smaller plant and the need for them opens up a very interesting market for the electrical contractors' skill.**

WIRING DIAGRAM *of the high demand warning device. A switch permits warning horn to be cut off. Red light goes out when load returns to normal. Green light indicates that warning horn switch is open.*




The customer was paying what he felt to be an unusually high demand charge on his power bill and had been approached to install power factor correction equipment. He asked us to give him an independent check on the electrical conditions in his plant and tell him what he ought to do about it. We set up a recording wattmeter on the service, taking load readings for a period of two weeks. We checked the power factor of the system and found that, due to the presence of several synchronous motors, the customer's power factor conditions were excellent and no correction equipment was indicated.

A study of the wattmeter charts, however, showed a number of peaks, which were traced to a battery of machines used for working the raw rubber. When these machines are charged with material they take a heavy load which gradually drops off as the rubber is worked. The high wattmeter peak occurred when new loads were started in several machines at one time, a coincidence not directly related to production routine. These peaks occasionally ran over the half hour time limit necessary to set higher demand charges for the plant, yet reorganizing the production department to run machines in cycles and avoid such peaks was impractical. Therefore the problem was reduced to providing timed peak limiting.

Maximum momentary demands ran as high as 300 kw. but a study of the graphic records showed that 170 kw. demand was a fair maximum for ordinary production requirements. Loads greater than this for the half hour demand period could be avoided if the shop superintendent could be warned in time to cut off a part of the load.

To meet these conditions we sold the customer a demand limiting board installed at the superintendent's desk. It consisted of a graphic recording wattmeter, a contact making wattmeter, a time delay relay, warning lights and a

*(Continued on page 51)*

"And now you'll burn,"
cried demon DUST
"I'll sit right down and fry ya!"
"What can we do?", the
contacts moaned,
"This devil is no liah."

"If we stood upright like
we should
As Cutler-Hammer's do
This bum could find no
place to squat
And we'd work better TOO."


Dirty contacts in Motor Control always make trouble. Dust between contacts causes heating and burning. But anyone knows dust and dirt *can't* collect on VERTICAL surfaces. So VERTICAL contacts *do* stay clean, *do* work better, *do* last longer. Send for your copy of the free booklet "Dust, the Destroyer." CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers*, 1306 St. Paul Avenue, Milwaukee, Wisconsin.

**ONLY VERTICAL CONTACTS CAN BE DUST-SAFE!**

CUTLER-HAMMER
MOTOR CONTROL
C-H


Earl Whitehorne, Editor

## NISA on the March

During the recent NISA Convention in St. Louis, one of the local motor shops had an idea. They carted a 30 h.p. motor up to the convention exhibit and did a rewind job on some Potter & Rayfield machinery on demonstration there. It saved five hours over their own estimate.

Well, it just drove home the thought that kept repeating throughout the convention—that as far as production is concerned, a motor shop is in the manufacturing business. It must have efficient machinery or it can't make good prices or profits, and it is time to recognize that new motor prices have been holding an umbrella over rewind prices for a long time. It is natural, therefore, that equipment methods and costs have taken advantage of this protection.

That's why NISA members voted, in open meeting, to go forward with the plan to study prevailing methods. They want to find out which practice is best and why and how much, what policies are most successful, as proven by the experience of members. They want to give this data to all members and stimulate the selective improvement of motor shop service standards.

And why not? It will bring better profits or larger markets for rewinds, or both, and a stronger industry. NISA is on the march.

## REA Buys Co-op Meters

Last September, NECA members asked if REA was going into business as a purchasing organization for the cooperatives. Meters for REA cooperative lines are now being bought by REA direct from the manufacturer for a number of cooperative projects. May we expect direct purchase of transformers, poles, switchgear, sub-station equipment also—by passing the distributor, wholesaler and contractor? And to what end?

Present channels for distributing electrical equipment are efficient. There has been no evidence of profiteering or collusion in the distribution of materials for REA projects. Quite the contrary! REA has had whole hearted cooperation from the contracting industry.

It costs money, time and organization to handle materials, especially these highly technical products. REA will get its meters cheaper by mass purchasing, but in turn must carry the cost of distribution to each project. If REA does not carry these costs, it must charge each project a purchasing fee. Will they be able to do a more economical job than the lean, hard bitten veterans of ten years of depression now distributing these products? We think not.

## What Contractors Want to Know

"See that hickey in the corner, with the two heads?" said a contractor. "We don't use it. We take two hickies to the job instead. It takes too long to change heads."

Again, a new fitting was brought out for electric metallic tubing. The salesman apologized because it cost a few cents more than the old one. This contractor asked how long it took to put it on. The salesman did not know.

Labor is the most expensive part of the job today. Wage scales are high, and somehow efficiency has dropped down. So the cost of materials and tools are secondary. What the contractor wants to know about a product is how easy it is to put in, how much time he can save with it. For time is what costs most. And wholesalers and manufacturers should have this in mind.

## The Key to Your Success

Paul Garret, director of Public Relations for General Motors, knows the public. He boils down the whole secret of making friends and getting ahead in business to these two sentences. He says—

*"Find out what your customers like and do more of it. Find out what they do not like and do less of it."*

In our language, that means—See that your men on the job, your office staff on the phone, and you and your people when you talk to customers—make people like to do business with you. It takes some care and thought. But it pays.

## Bad Short Circuits

A Chicago contractor listed six recent fixture jobs lost to direct jobber competition. They did not amount to much money, about $500 in all, but they were typical apartment house orders. The owner asked the contractor for figures and then went over to the jobber who quoted him trade prices and took the business.

These same jobbers would probably be among the first to tell us what a lousy salesman the contractor is. For good clean fun, we think it would be nice to sit on the sidelines, watching one of their salesmen selling a customer against direct factory competition at jobbers' cost.

The amounts involved represent typical bread and butter jobs for the contractor, the kind he lives on. They certainly were not large enough to induce anyone to break the normal channels of distribution—unless such practices were commonplace. But that's just what they are! And it is high time the contractor called for a show-down. To qualify for wholesaler's discount, the jobber should stick to selling for resale. If he wants to run a business in competition with his own trade, let him set up a separate store or get out of the wholesaler classification entirely.

## Not Hungry For Our Stuff

Normal human beings consume an average of one carload of food each year. If you eat less meat, you eat more fish; more beans, less potatoes; more spinach, less bread—maybe. So the food shops can count on a regular volume. It all depends on which food gets it.

With us it is different. Our customers may quite forget their electrical systems and spend their money on a building improvement, a new machine, a new show case, or a new car. Yet manufacturers, merchants, householders—they all can be interested in efficiencies, economies, comforts, offered by improvement in their electrical equipment. Selling is still our weak spot—and the big opportunity.

## Counting A/W Returns

The big job was to dramatize adequate wiring on a nation-wide scale. Public interest is now growing. The next step is to generate wider appreciation, more confidence and purpose, within the industry. But it cannot yet be done on the basis of analyzing actual returns now coming in.

This program is just beginning. We can not just weight the cold figures—that a mere so many new homes have been certified. The real value lies in the benefits to the wiring contractor, wholesaler and manufacturer through more outlets installed. In Cincinnati for example A/W layouts added 1,554 outlets. In Chicago about 5,000 more were sold. This shows that selling A/W means Selling-Up. Nationally it offers a big increase in electrical work in home construction. It is a measure of profit to contractor and wholesaler that is so far not fully appreciated. Local groups can quicken this interest by counting the A/W returns and telling everybody.

## Colored Display Lighting

Another cycle of color lighting for store window displays is on the way. We had one ten years ago, it faded out, now it appears again. Blended color lighting of background and general display with the sharp punch of high intensity white spotlighting on the key merchandise is the fad of the moment.

It is time to cash in now with color screens, higher wattage lighting equipment, color cycle control and spotlights while this trend is growing. It may not last.

## Color Coding

Electrical inspectors propose a change in Article 2104 of the 1937 Code that will require consistent color coding throughout the job. But at the same time they would permit the use of wires of other colors than those specified, where more than one multi-wire branch circuit is run in a conduit. This proposed change should receive the backing of the electrical contracting industry. Many contractors have felt that, in its present form the rule places limitations on the use of color identification that were obviously not intended. The new rule would relieve these limitations.

# Back Talk

### True and Sad

**To the Editor**—"As an electrician, contractor and hardware dealer, I would like to suggest to manufacturers and wholesalers that they have one standard size of catalogs, literature and pamphlets. In loose leaf form, architects, engineers and contractors may put it in file with least effort. Now we have all sizes of catalogs, anything from 3-in. by 6-in. to 14-in. by 16-in. How can anyone build shelfs and save spaces and keep a good file of such catalogs? The 3-in. by 6-in. I use now and then, but the 14-in. by 16-in. I never use. I put it under all the rest of the catalogs and I may as well not have it. My suggestion is a 10¼-in. by 10¼-in. sheet that leaves 7 inches for printing and 3 inches for binding with 3 or 4 binding slots. Another good feature is that manufacturers can keep catalogs more up to date, as you only have one sheet to print."

**J. E. Matany,**
**Allstate Electrical Co.,**
**Dearborn, Michigan.**

*Your idea is sound and, of course, many manufacturers furnish architects with standard size sheets to fit their uniform files. But the competition for distinction in the appearance of advertising material continually impells all manufacturers to do something different. They sacrifice convenience in filing to get attention. And there you are, as Caesar used to say.*

### Contractor Examinations

**To the Editor**—"I want to compliment you on your fine story about the Michigan practical examinations in the March issue. Our contractor groups in the Mount Pleasant area are much enthused and are requesting local newspapers to reprint portions of it.

"We found the best combination on the work boards at the practical examination was for the applicants to do five boards with a maximum score of 20 points per board and a time limit of 20 min. per board. Figuring lost time, this requires about two hours for the practical work examination. We have also added to the test boards so that we now have a total of 44 boards."

**Carl D. Mason,**
**District Electrical Inspector,**
**Electrical Administrative Board,**
**Mt. Pleasant, Mich.**

*We feel that all contractors should be interested in this development. It sets up a practical method of proving whether or not a man is really competent to be an electrical contractor. It safeguards the public and also protects the contracting business against demoralizing work by amateurs.*

### What States License?

*So many questions come in asking us in what states contractors are licensed, that we print this list for others who may want to know. Electrical contractors are now obliged to take out licenses in seven states—Massachusetts, Michigan, Minnesota, North Carolina, North Dakota, Oregon and Washington. In five states journeymen electricians are also licensed. They are—Massachusetts, Michigan, Minnesota, North Dakota and Oregon.*

### One Manufacturer Says "Yes!"

**To the Editor**—"I have just read your editorial in the March issue of *Electrical Contracting*—'Try Resentment.' The light of publicity cures many ills. In fact, its about the best remedy we have, and I think you did a good job in suggesting that it be used by contractors whenever they feel that they have been unfairly treated."

**D. H. Murphy, President,**
**The Wiremold Company,**
**Hartford, Conn.**

*Many contractors feel that there is no use trying to resist unfair discrimination by manufacturers and wholesalers in giving unearned discounts that make for unfair competition. We believe that public resentment will help. We cite Mr. Murphy's endorsement as notable. He has been long in the industry and knows conditions. As ex-president of NEMA he speaks with weight of these things too.*

### House Wiring Differences

**To the Editor**—"We have been in the electrical contracting business for the past eighteen years and up to 1935 mostly all of our work was house wiring. Since then we have lost most of this type of work. We don't seem to be able to compete with the non-union contractor, who is now doing almost 100 per cent of this new work.

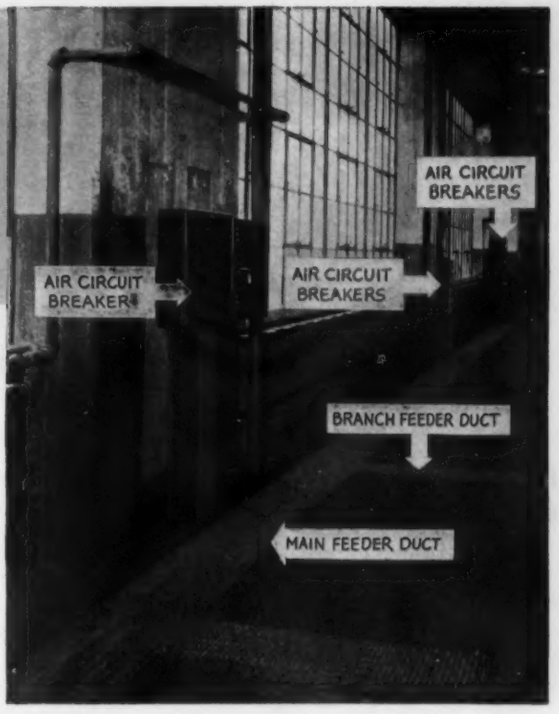
"In the past year, we have made several surveys to try and recapture this work, and I am enclosing data on a one-family house which we wired not so long ago. Comparing my data with some of your fine articles in reference to house wiring costs, it appears that the contractors are all wet, or something. The situation narrows down to this—non-union contractors in this territory get an average of $1 to $1.25 per outlet. Our union contractors want $2. One of your recent contributors showed a schedule based on about $4 per outlet. Out in Vancouver they want $2. I can't see why all the difference."

**Joseph J. Tomsulo & Co.,**
**Roselle Park, N. J.**

*It is unfortunately true that residence wiring costs seem to run all over the scale. And too often the weight is at the bottom side. It narrows down to labor costs, kind of wiring, quality of material and margins of profit. But as homes are more adequately wired the tendency is to employ more responsible contractors and to use better grades of material. The challenge lies in attaining greater skill in doing quality house wiring and in selling adequate layouts, good workmanship and quality material.*

# of Your "IC"

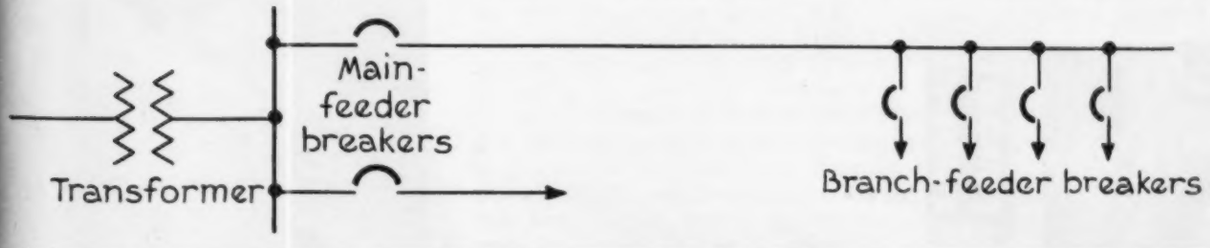
**(Interrupting Capacity)**




THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits, and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They seriously endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices. Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

*If you have any question about how to determine the interrupting capacity needed, in order to know the size of circuit breaker to use, get in touch with the nearest G-E office.*

## How To Select G-E Air Circuit Breakers with Adequate Interrupting Capacity




| Transformer Capacity in Three-phase Kva | Circuit Voltage | | | | | |
|---|---|---|---|---|---|---|
| | 220-240 Volts | | 440-480 Volts | | 550-600 Volts * | |
| | G-E Air Circuit Breakers to Use—Interrupting Ratings (Rms Amperes) and Type | | | | | |
| | Main Feeder | Branch Feeder * | Main Feeder | Branch Feeder * | Main Feeder | Branch Feeder * |
| 300 | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A |
| 500 | 20,000—AE-1B | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A | 10,000—AE-1A |
| 750 | 40,000—AL-2 | 20,000—AE-1B | 20,000—AE-1B | 10,000—AE-1A | 20,000—AE-1B | 10,000—AE-1A |
| 1000 | 40,000—AL-2 | 20,000—AE-1B | 40,000—AL-2 | 20,000—AE-1B | 20,000—AE-1B | 10,000—AE-1A |
| 1500 | 60,000—AL-2 | 40,000—AL-2 | 40,000—AL-2 | 20,000—AE-1B | 40,000—AL-2 | 20,000—AE-1B |
| 2000 | 60,000—AL-2 | 40,000—AL-2 | 40,000—AL-2 | 20,000—AE-1B | 40,000—AL-2 | 20,000—AE-1B |

*These breaker selections are based on the use of the listed main-feeder breakers, which are equipped with modern arc quenchers and the operation of which properly co-ordinated.

†All selections are based on average conditions, which include transformers of not less than 5 per cent impedance, and no connected synchronous motors of appreciable capacity.

**E L E C T R I C**

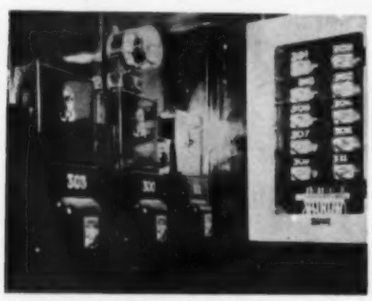
890-77

# WIRING Methods

## FLEXIBILITY FOR OFFICE METERING

The Paul Building in Utica, N. Y., is an example of the smaller office structures in every city, where branch circuits for tenants must be rearranged for metering every time office areas are altered because of tenant changes. Usually the tenants in small buildings are required to have their own meters and are under separate lighting contracts with the power company. The problem is to provide a flexible arrangement of the circuits serving the various offices and to make them available for connection to any set of approved meter equipment without expensive alteration.

In rewiring the third floor of the Paul Building, the Langdon-Hughes Construction Company installed twenty-one



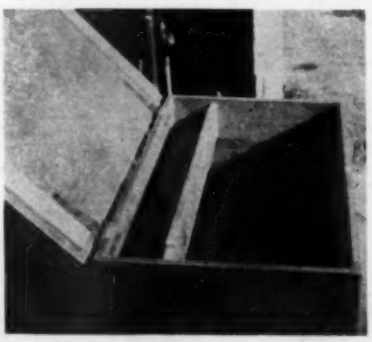
*TENANT METERING changes can be made without confusion and with minimum wiring.*

60 amp., 3 pole, solid neutral meter switches with the power company's meter testing cabinets above each switch. These switches were all connected to sealed main line service conductors. Metered subfeeders of No. 6 wire were extended in wireways from ten switches to a branch panel at the left, and from eleven switches to a branch panel at the right of the meter bank. Each panel contains separate fuse blocks for circuits serving one-half the offices on the third floor. One or more circuits serving a tenant may be readily connected within that panel to the metered sub-feeder. When changes in space occur, all circuit transfers from one meter loop to another are made without any alteration or disturbance to the service or main line feeder conductors. With 60 amp. 3 pole switches, any meter loop will handle a sizeable office load.

A 100-amp. switch controls the feeder supplying this group of switches. These conductors are enclosed in a two-row arrangement of switches spaced on 13-inch centers and interconnected with 4½-in. by 2½-in. by 5 in. long wireways. Numbers stencilled on switches are likewise provided at the circuit fuses to provide easy identification.

## FOR TOOLS AND MATERIAL

This strong metal-bound, tool and material box developed by Eugene Gartley of Bakersfield Electric Company, Bakersfield, California, can be carried to the job and left there for the use of his men. Made of heavy plywood, with strong galvanized iron reinforcing at the corners and edges, the box is long enough to contain hickeys and pipe threaders, as well as fittings and other tools and supplies needed on the average job. The top is completely covered with metal, lapped over sufficiently to make the box rain-tight. It is a convenience to the men on the job and means a saving in transportation of tools back and forth.

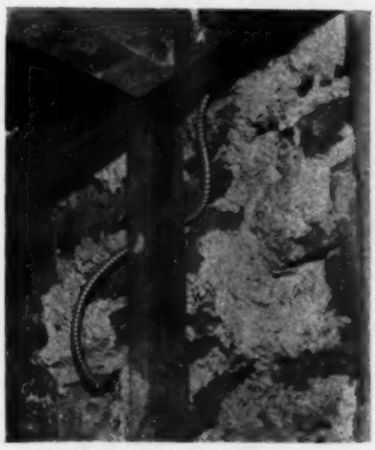


*MONEY SAVER—Metal bound tool box carries materials also and stays on the job.*

## CONNECTING OUTLETS PRESET IN STONE

When stone house walls are built it is usually too early for installing the rough wiring, although certain outdoor outlets must be placed for the masons. To simplify making armored cable connections later to such outlets, the Jenkintown and Glenside Electrical Construc-

*EXACT SPOTTING—Outlets set in stone walls before installing armored cable, made accessible from inside with short nipples.*

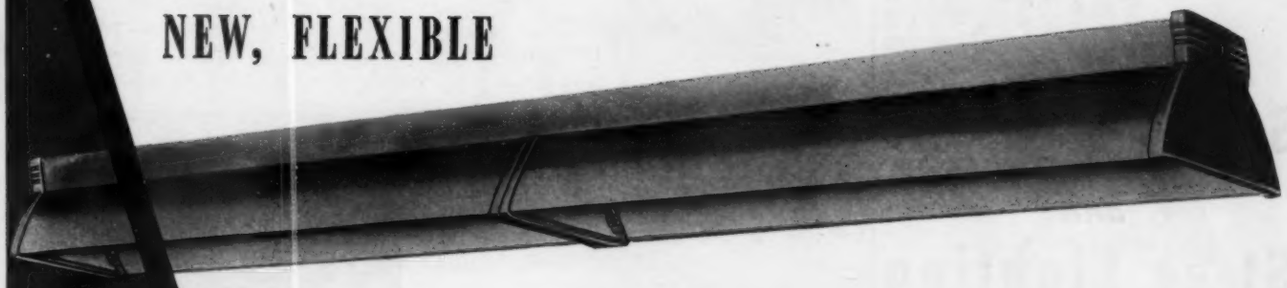


*CONNECTED LATER—Nipple from pre-set box has coupling to receive armored cable connector from which wires lead out through stone wall.*

tion Company of Jenkintown, Pa., had the masons install all outdoor outlet boxes complete with conduit nipples and couplings on the end that extended to the inner wall line.

Thus these boxes could be set in their exact positions and mortar trowelled to them to close the outer wall surface. Armored cable supplying such outdoor outlets was connected to the nipple couplings, after being stripped of sufficient metal armor to extend through the nipple and into the outlet box.

# NEW, FLEXIBLE



# CAPTURE THE CURTIS FLUORESCENT MARKET WITH LIGHTSTRIP

Designed in all necessary reflector shapes . . . available in any required lengths . . . with both plain and decorative endcaps . . . hanger equipment designed for exposed, concealed or pendant mountings.

Decorative applications: Theatres, restaurants, bars, cocktail lounges, lobbies, foyers, reception halls, dance halls.

Industrial applications: Inspection tables, assembly lines, art studios, drafting rooms, photographic studios, craft shops.

General applications: Stores, display rooms, dressing rooms.

Architectural and built-in applications: Recessed lighting, coves, surface mounting, pendants, niche lighting, troughs.

Profitable to contractors because the wiring is simple, quick, and logical. (Wiring diagram lower left corner of page.)

The durable quality of Fluorescent LightStrip is a credit to you in the eyes of your architect and builder customers.

***Catalog data is offered in a colorful Fluorescent LightStrip Booklet. Please write for No. S.1015.***

Curtis Lighting

1123 WEST JACKSON BOULEVARD

NEW YORK CHICAGO TORONTO

WIRING Methods

[FROM PAGE 24]

## A MARKET CHANGE-OVER

In the remodeling of a large market building known as "Food City," at Bakersfield, Calif., all the facilities in the building had to be kept "hot" for the use of the tenants while the change was being made. The Bakersfield Electric Company did the work in the old building. It was originally wired completely in knob and tube, and was changed over to a conduit installation. New metering and control panels were installed in the basement.

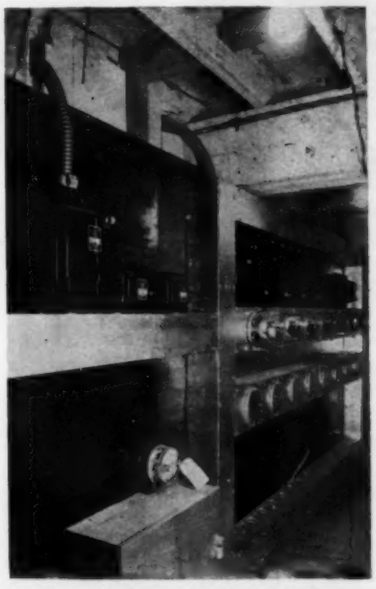
A food market such as this requires the utmost accessibility since most of the tenants are individually metered and

*BEFORE—Switch control side of panel during the changeover.*

changes in tenancy, and load requirements, are the rule rather than the exception. The two accompanying photographs show the work in progress on one side of the panel, and finished on the other.

A new 400-amp. power service was brought in to the main distribution panel and the old 200-amp. power circuit also retained. The new control panels are arranged on both sides of a wooden partition mounted along a narrow corridor. On the side nearest the outside wall are the meters and meter disconnecting switches. This meter board is also in two sections, the left for heavy power loads, with ample space allowed for meter current coil housings. On the right side of the board, gutters were made up and welded together in a flexible arrangement that provides sockets for a large number of meters. Below this gutter are meter rings with capped outlets for future tenants.

Lighting and power control panels are mounted on the opposite side of the board, also connected by gutters. Ex-



*AFTER—Metering side of panel after completion of changeover.*

ternally operated switches are mounted for individual circuit control. The picture was taken during the changeover and shows part of the new gutter system in place, part of the old still operating.

---

*TRUCK ADVERTISING — Working the "shop on wheels" idea to a point where three trucks are now in steady operation, Arnold Kleiner of Newark, N. J., makes them advertise his services. A novel advertising idea employs the use of changeable metal frames that attach to the front door panels. These panels bear a short advertising message and are replaced by spare frames giving a new thought, every two or three weeks. The truck shown carries one of these frames which is lettered "Consult us for your Electrical Needs".*

---

### Facts from Pictures

Doster & Egan of Syracuse, N. Y., display pictures of their recently wired structures as do many other electrical contractors. But this company's "gallery" bears evidence of the extent to which some firm's activities run to out-of-town-jobs. For out of eleven imposing buildings wired recently, only one was a local job.

# Motor Shops

## STAFF BULLETIN BOARD

Since service work involves personal contact and personal leadership, the Sterns Electric Equipment Company of Buffalo, N. Y., makes it easy for customers to know its department heads. There are seven departments handling the Sterns organization's business, so to make their names register with drop-in customers, a 4 by 6 ft. bulletin board near the front counter lists these departments, names those in charge, explains the work handled, and also includes a listing of the personnel in each group. It's a "get acquainted"


*GET ACQUAINTED BULLETIN near front counter makes customers feel at home with the staff and also know its functions.*

chart of the electrical service business that makes a friendly impression upon the customer.

The departments listed are: motor repairs, construction, motor sales, machine shop, supplies, service and store, and accounting.

## ARMATURE WINDER

Boosting fractional hp. armature winding production from one a day by hand methods to as high as 12 a day by machine is the record claimed for a winding machine built by E. T. Sharpe for the E. T. Sharpe Co. motor shop in Davenport, Iowa. Made of odd parts, the machine consists of a welded floor stand with a ⅙ hp. motor driving a gear reduction unit. The slow speed shaft is coupled to the winding head

*HIGH SPEED armature winding machine is operated by foot clutch.*

through a foot operated clutch.

An adjustable armature holder grips the armature shaft. A hook at right angles holds the loops during winding.

## REPAIRING GENERATORS FOR ENGINE HEADLIGHTS

For 21 years the Duval Electric Company of Albany, N. Y., has reconditioned electrical equipment used in the railroad business. One of the specialties in this line of repair work is the locomotive headlight generator. Several armatures in various stages of rewinding, and a generator operating under test, are shown.

Operated at 3,800 r.p.m. by direct connected steam turbines, these 32 volt

*RAILROAD REPAIRS—Five special armatures from locomotive headlight generators in various stages of repair.*

*RUNNING TEST—Belted motor rotates turbine and 3600-rpm., 32 V generator, being tested by 750-watt bank of lamps.*

d.c. generators require careful reconditioning to minimize short circuiting trouble due to dirt, grease and high temperature operation. Although normally operated in a totally enclosed frame, this equipment is subjected to serious abuse.

The armatures are drum wound with No. 15 Deltabeston magnet wire. A rewind requires about 8 hours. They receive three impregnations in varnish followed by a 12-hour baking after each dipping. During rewinding, 40-segment commutators were installed to replace 20-segment commutators.

Reconditioned generators are given a 1-hour running test for balance, sparking and load performance. The turbine is fitted with a V-belt sheave and driven by a 3,600-r.p.m. 2 hp. motor on the test stand. Three lamps of 250 watts each provide artificial load for the generator.

## BENCH TURNTABLE

A bench turntable for handling stator work is a handy idea applied in the motor repair shop of the French Gerleman Electric Company of St. Louis, Mo. A heavy wood disk, 2 inches thick and banded with iron, is mounted on a boiler flange screwed

*HANDY TURNTABLE for stator work slips into place on the bench for handling heavy frames.*

to a short 2 inch pipe nipple forming a spindle. A bearing consisting of a pipe insert is set flush in the bench top.

When not in use the turntable may be lifted out of the bearing and stowed away to clear the bench.

## Motor Shops

[FROM PAGE 28]

### STORAGE INDEX

In the large motor shop stock rooms, the thousands of small items used make some form of index system desirable. The Spaulding Electric Company of Detroit use a system of bin numbers associated with a perpetual inventory

*CABINET NUMBERS conspicuously mark each cabinet or rack, keyed to stock inventory card for quickly locating parts.*

card system that provides a quick and easy method of locating any item of stock carried.

Each large bin or rack is marked with a large letter and number at the top with each drawer or box in the bin numbered consecutively. These numbers keyed to the inventory card permit even an inexperienced workman to quickly locate the part needed.

*UPTOWN DISPLAY—The Andrews Motor Works of Modesto, Calif., tells the story of its services in the shopping district. Here is the window of a vacant store bedecked with this company's instruments as used in making plant surveys. Action is provided by means of an automatic slide machine which repeats its message to lookers-on. Photo postal cards of these window displays are sent to 150 industrial customers. Frank Andrews believes it is better to go to the mountain than wait for the mountain to call around.*

The measure of experience lies not so much in mere ability to build a good product, but rather in the exact balance of design with utility that makes a product unfailingly RIGHT for the job it must do.

*Low Cost*

MULTI-BREAKER PANELBOARDS



*Simple .. Troubleproof Circuit-breaker Protection*

*Right* **for These Reasons**

Sturdy construction, convenient installation, long life — boxes of code gauge galvanized steel — textolite molded enclosure with insulated metal cover — adjusting screw and lock nut permanently set and sealed at factory — breaker mechanism trip free of textolite handle, handle trip indicating — arc-chamber lining resistant to arc — bi-metallic element welded to its support providing strong rigid latch against vibration — thermostatic element, carefully calibrated and sealed at factory, opens breaker on overload but prevents harmless interruption of service under temporary overloads — breaker can operate thousands of times without damage to element — molybdenum silver arcing contacts on both blades and block give low resistance, long life and ability to withstand severe short circuit.

*Right* **for These Applications**

Neat, compact, simple in construction and trouble-free in service, Trumbull Type NM1B Multi-Breaker Lighting Panelboards are particularly applicable to installations in modern homes, stores, school buildings, office buildings and institutions . . . where space limitation is a controlling factor and fine appearance important. Available with up to 42 circuits.

In addition, NM1B Panelboards, utilizing the Type M breaker unit, permit the design of special bus construction for extreme flexibility in the arrangement of circuits. Although moderately priced, these panelboards will fully measure up to the high standards of quality and finished appearance characteristic of all Trumbull Products.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY

PLAINVILLE — A GENERAL ELECTRIC ORGANIZATION — CONNECTICUT

*Right* ON THE JOB

PRODUCTS THAT ARE RIGHT FOR THE JOB . . . SERVICE THROUGH WHOLESALERS AND CONTRACTORS WHO ARE RIGHT ON THE JOB

# Better Lighting


**SELF-IMPOSED FACE LIFTING**— *Applying modern luminous advertising principles to its own quarters resulted in a modernized store front for the Charles A. Hooven Company of Philadelphia. Stippled glass transom panels were removed and replaced with luminous material bearing a dignified company ad. Behind the panels are six 150-watt lamps enclosed in silvered glass reflectors. This installation provides the same advertising medium after dark as is secured during the daylight hours.*

## FLOWER SHOP GOES FLUORESCENT

The Haase Brothers Flower Shop on Jefferson Avenue just south of Main Street in Peoria, Illinois was dissatisfied with its lighting system. The small rectangular shop fronted by a show window on the street and a mirror glass partition at the rear boasted a single 200 watt direct lighting unit and three

**FLOWERS SHOW** *to best advantage under this modern fluorescent lighting system at the Haase Brothers Flower Shop in Peoria, Illinois.*

100 watt window lights. They consulted Carl Dierking of the Southside Electric Company, Peoria lighting specialist. Dierking came to the rescue with daylight fluorescent tubes.

Four lines of fluorescent tube lighting now radiate from the corners of a square central marble pillar to the four corners of the store. Similar tubes are placed end to end the full width of the show window. The wiring trough was surface mounted.

Sixteen "daylight" 24 in. tubes were used for the store interior lighting and five for the show window. An average intensity of 25 foot candles of "daylight" quality light is available in the store. The owners report that there is not only more light but that the daylight quality of the light brings out delicate shades of color in the flowers that were never before apparent under artificial light.

## BARBER LIGHTS ON WHEELS

Not long ago Chester Tressel, electrical inspector for the City of Canton, Ohio, was getting a shave at Rohn's Barber Shop. With the baseball season well over, the barbers, noted for their loquacity, started their old argument as to where lights should be placed when the barber shop was modernized. Each man insisted that a luminaire be placed directly over his chair. No agreement could be reached. The barbers were becoming quite heated in their discussion and came dangerously close to mutilating the long-suffering Mr. Tressel with their razors.

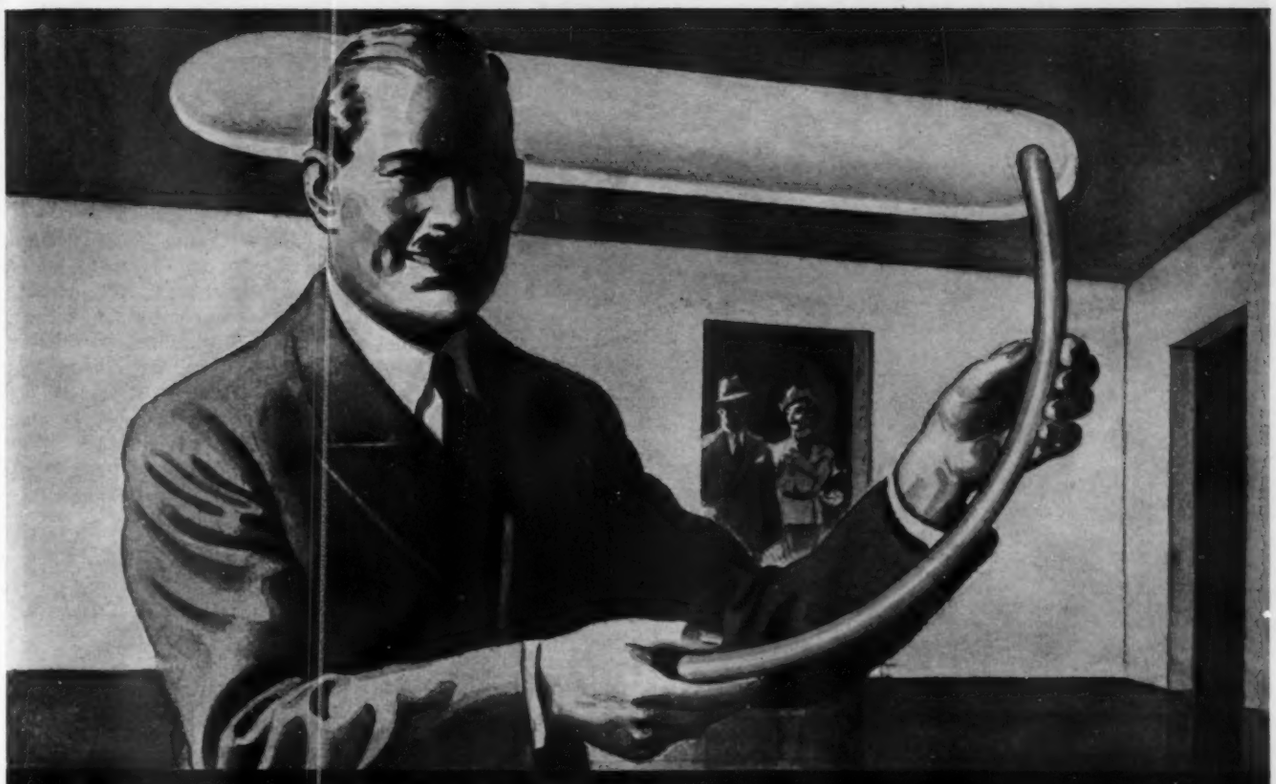
Determined to put a stop to the fight, Mr. Tressel brushed his clothes, took Mr. Rohn, owner of the shop, by the arm, led him to the Furbay Sommer Company, a Canton electrical wholesaling firm, and pointed out a trial installation of "Trol-E-Duct" whereby lights on trolleys can be moved where and when wanted. Rohn liked the idea and called in the Hilscher-Clarke Electric Company.

A 20 ft. run of duct was attached to the ceiling by means of hangers and fed from the end by a feed-in end cap. Five semi-direct opal glass lighting units were wired to drop cords and suspended from trolleys inserted in the duct run.

Voila! Each barber now has his own individual light and can do whatever he pleases with it—move it up or down or roll it along the overhead track to just the position best suited to his temperament.

A 50 ft. run of the trolley duct system was also installed along the baseboard of the barber shop. Hair clippers, electric shavers, and other electrically powered barber's tools now can be plugged in anywhere along the duct run. The continuous outlet feature of the duct system is popular with the barbers. Clever these Cantonese!

*SATISFIED BARBERS—Out of an argument among the barbers came this installation of Trol-E-Duct at the Rohn Shop, Canton, Ohio.*



# These *CURVED* Fluorescent Lamps *MULTIPLY Your Profits!*

**Interest in Fluorescent Lighting is rapidly gaining momentum. You can turn this intense interest into dollars of profit with Flex-O-Lite.**

Flex-O-Lite increases your number of prospects by adapting Fluorescent Lighting to a wider variety of new uses. Many difficult lighting problems are now easy to handle, and Flex-O-Lite installation costs are so low that they come within nearly any budget.

Flex-O-Lite Lamps are unique because they are made available in a standardized selection of both straight and CURVED lengths. DAYLIGHT WHITE is recommended for illuminating purposes, and NINE other colors for unusual decorative effects. Installation is made with simple tools.

**St. Charles Technical Laboratories, Inc.**

R. A. WARREN, *President* St. Charles, Ill.

**FLEX-O-LITE**

TRADE MARK REG.


**Your copy of "Flex-O-Lite Facts" includes complete information on the remarkable economy and efficiency of this ultra-modern type of illumination. SEND FOR YOUR FREE COPY OF "Flex-O-Lite Facts" TODAY.**

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Please send me a free copy of "FLEX-O-LITE FACTS" together with complete specifications and details on FLEX-O-LITE.

*Name* .....

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*City* ..... *State* .....

☐ Electrical Contractor ☐ Jobber EC-5

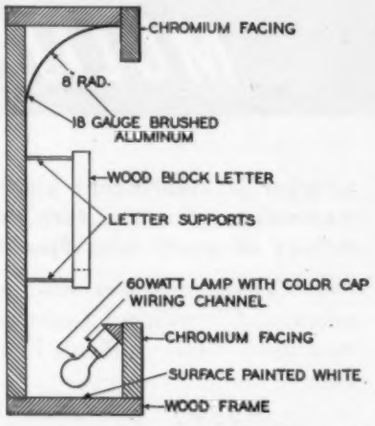
*Better Lighting*

[FROM PAGE 32]

## MODERN TRANSOM TREATMENT

When Love's Confections, Inc., of Rochester, New York, recently added this store to their chain, it was decided to replace the transom glass with a luminous sign. Stock sheets of number eighteen gauge aluminum, three feet wide and ten feet long were deeply scratched on one surface by a sanding belt. The scratches running horizontally were highly lighted in a ribbon-like effect by alternate 25-watt lamps with yellow color caps and 60-watt lamps with green color caps on 6 inch centers.

TRANSOM SIGN—*Simple use of transom space, combining scratched aluminum background cove and silhouette letters.*

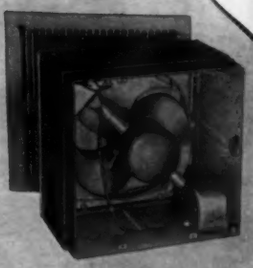



CONSTRUCTION DETAIL — *End view of transom sign installed on Love's shop.*

By curving the upper portion of the aluminum, the so-called ribbons of light appear slightly brighter and longer. At the same time the background of the sign, from a distance, appears to be luminous when lighted. Wooden block letters are supported about four inches forward of the background. The face of the letters are painted a pale green and the sides a primrose yellow. The lamps have a dimmer, to create a multitude of color schemes.

# NEW ILG LINE FOR '39

**ILGAIRATOR (below) . . . window filter unit for fresh outdoor air without dust, soot, or pollen.**



**BUILT-IN AUTOMATIC ILGETTE (above) . . . kitchen ventilator with motor operated door, controlled by convenient wall switch.**

**ILG-ROLLAIRE (right) . . . portable fan for night air cooling of homes. No installation is required.**

**SELF-COOLED MOTOR PROPELLER FAN (left) . . . for ventilating and cooling offices, stores, shops, etc. Sizes: 9½ to 72 inches.**

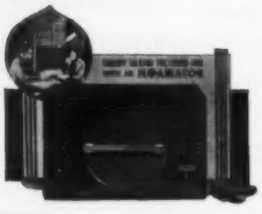
**ILGWIND ATTIC FAN (at right) . . . Put at open window and plug in outlet. Cools house.**

**PORTABLE PANEL KITCHEN VENTILATOR (above) . . . Can be quickly installed in the ordinary kitchen window.**

## $100.00 PRIZE

## FOR BEST ILG WINDOW DISPLAY


The most effective Ilg window display wins $100 in cash. All dealers eligible. Ask for entry blank at once!



Every authorized dealer, placing orders for specified Ilg equipment will receive, without charge, an illuminated, animated display; a display stand, or an Ilgairator exhibit . . . one each or all three.

New cooling and ventilating units have been added to the Ilg line—the line that has a national reputation for efficiency, economy, and reliability. There's more variety—wider price range—greater sales appeal in this new and complete Ilg line.

Above all, there's consumer recognition—a name and trade mark that mean something to the public. They identify the only electric ventilator with fully enclosed, self-cooled motor—made, sold, and guaranteed as a complete unit—one responsibility! Sign and mail coupon for full details *now*.

**ILG ELECTRIC VENTILATING CO.**
**2879 N. CRAWFORD AVE., CHICAGO, ILL.**
*Offices in 43 Principal Cities*

ILG
VENTILATION
*and Air Conditioning*

*Free* **CONDENSED CATALOG**

Without obligation, send your new 48-page Condensed Catalog with prices and trade discounts.

Name _____

Full Address _____

_____

ILG'S THE LINE FOR '39

ELECTRICAL

# Maintenance

INDUSTRIAL AND COMMERCIAL

## AND NOW ABOUT BATTERIES

IT is the equipment that we work with constantly, that we know best—motors, control, lighting, circuits. But no maintenance man can say when something new is coming into the plant to be cared for, when some better opportunity in some other plant may bring other problems that call for knowledge.

Storage batteries and rectifiers are a good example. If they do not figure in your daily duties it is easy to get stale on the background facts. And so in this chapter of these Maintenance Guide Sheets, we review them—types and maintenance—and chart the troubles and what to do. We hold it short for check up only. For fuller details go to the text books and the manufacturers literature.

This series of articles began in January, 1938, with a frank review of the electrical maintenance man's job. Then came—

1. Alternating Current Motors—Types and Applications
2. Direct Current Motors—Types and Applications
3. Alternating Current Motors—Maintenance
4. Direct Current Motors—Maintenance
5. A.C. Motor Starters and Controllers—Types and Applications
6. D.C. Motor Starters and Controllers—Types and Applications
7. Maintenance of Control Equipment
8. Special Control Problems—Heavy Installations and Maintenance
9. Electric Distribution — Circuit Protection—Power Factor Correction
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers (this issue)

Coming articles will discuss

17. Electroplating
18. Electronic Devices
19. Transformers and Circuit Breakers
20. Equipment for Hazardous Locations
21. Wiring Devices and Cables
22. Drives
23. Elevators, Conveyors, Cranes and Trucks
24. Ventilating and Air Conditioning Equipment
25. Management of Maintenance

# Batteries and Rectifiers

## Types and Maintenance

DIRECT current is required for operating certain types of equipment and loads such as in industrial plants, commercial establishments and institutions. It is required in various amounts from a fraction of an ampere at low voltage for operating a relay to thousands of kilowatts at high voltages for electro-chemical processes.

Batteries and rectifiers have long provided a reliable means for furnishing this power. But because progress has been made in their design and construction, and their use is increasing continually, they are of growing importance to the maintenance man. Therefore present practice in the application and care is worth reviewing.

### Batteries

Electric batteries provide a convenient method for generating a direct flow of electrical energy from chemical energy. The process is simple—for each cell consists of two conducting electrodes of different composition, immersed in a solution termed electrolyte. Connect them to the circuit and the current flows.

Battery cells are divided into two classes—

1. Primary cells, which may be either the so-called dry cells, or the wet cells used extensively in railway signaling.
2. Storage or secondary cells, also known as accumulators, which can be restored to original condition by passing a charging current through the cell in the opposite direction to that of discharge.

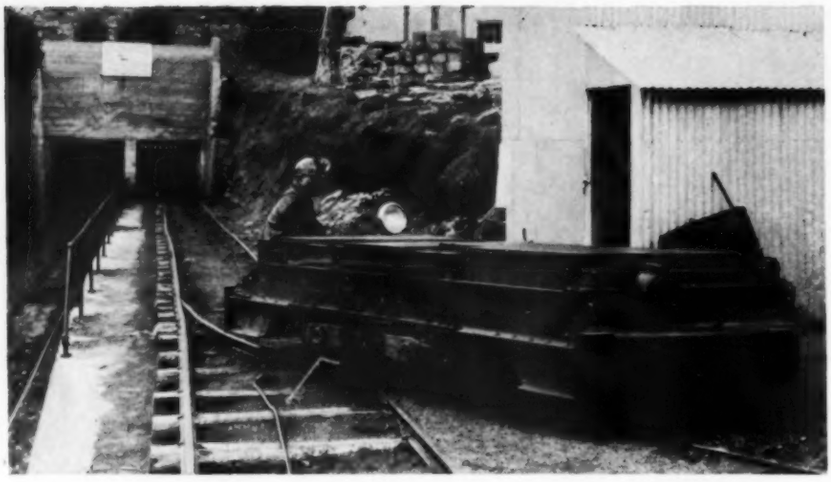
It is the storage battery that is of interest to the industrial maintenance man.

### Storage Batteries

Commercial storage batteries may be divided broadly into two classes—the lead-acid type and the nickel-alkaline.

In the *lead-acid type*, the positive active material is lead peroxide. The

*EQUIPPED—with powerful storage batteries, electric lift trucks speed up production and through their use available floor space can be increased. (Electric Storage Battery Co. photo)*



*TWO TYPES OF SERVICE—One storage battery supported by shoulder strap provides power for motorman's electric safety cap lamp. Another storage battery on locomotive furnishes power for 15-car hauls (38 tons of coal) up to 1,600 ft. and on grades up to 3 per cent in mines of Canon Coal Co., near Berwin Canyon, Colorado. (Thomas A. Edison, Inc. photo)*

negative active material is finely divided spongy metallic lead. The electrolyte is a dilute solution of sulphuric acid. Some containers are of hard rubber and others are glass jars. This type of battery averages two volts per cell and has as advantages its ability to discharge at a high rate of current and carry heavy loads and to be charged rapidly for short periods.

In *nickel-alkaline batteries,* the positive active material is nickel hydrate in nickeled-steel tubes attached to a nickeled-steel grid. The negative active material is iron oxide, contained in nickeled-steel pockets and forced into openings on a grid. The electrolyte is alkaline, a solution of potassium and lithium hydroxide. Container and cover are nickeled steel and welded. This type of battery averages 1.2 volts per cell and has as its advantages that it is light in weight, can be held out of service without deterioration, and is not injured by accidental charges in reverse direction.

Storage batteries are used in industrial plants and commercial establishments for operating annunciators, call bells, circuit breaker control, electroplating, emergency lighting, elevator operation, fire alarms, gas detection, industrial and street trucks, laboratory service, meter testing, portable spot lights, scientific instruments, telephone service, time clocks and recorders, watchmen's lanterns, starting internal combustion engines, and other purposes.

In selecting batteries, consideration must be given to the type of service for which it is required, with attention to (1) maximum short time current demand, (2) ampere-hours to be supplied by battery per day, and (3) type of service—stationary or portable. Then when a battery is received, it must be unpacked carefully and given an inspection. When first put in service, the battery should be given a freshening charge. Compartments and rooms in which batteries are used must have free ventilation at all times, and be constructed so that water, oil and dirt will be excluded.

Batteries also should be located so that cells are accessible for adding water and for ease of inspection. Each cell or battery should be placed so that the positive terminal of one adjoins the negative terminal of the next one. The positive lead of the battery charger is connected to the positive terminal of the battery, and the negative side correspondingly.

All surfaces which are to be bolted together, also the bolts themselves, should be wiped clean and coated with a thin film of vaseline or approved grease. The complete installation, including leads, busses, protective devices and other equipment, should be installed to meet Code and local regulations.

### Battery Maintenance

The care and maintenance required by lead-acid and nickel-alkaline storage batteries varies in detail, with the operating conditions and the character of service, but the following simple rules are of general application:

1. Keep the cells clean and dry, wiping off any deposits of dust and moisture as often as may be necessary.
2. Avoid excessive temperatures. Sustained cell temperatures above 100 deg. F. or repeated recurrence of temperature above 115 deg. F. for shorter periods will shorten the life of plates.
3. Keep the electrolyte at the normal level specified by the manufacturer, and at all times above the tops of the plates and separators, by adding distilled or approved water to the cells.
4. Avoid over discharging and after a substantial discharge recharge as soon as practical. Avoid excessive overcharge, and see that every cell in the battery is brought to a full charge periodically.
5. Keep charging rates within limits that will avoid excessive gassing and keep cell temperatures over 115 deg. F.
6. Provide sufficient ventilation to prevent the accumulation of gases. Avoid bringing a flame or causing a spark near the cell vents.
7. Never add electrolyte or acid except under conditions given in instructions for the respective cells or battery.
8. Have filling plugs locked in place at all times, except when adding water or taking hydrometer readings.
9. In the case of floating batteries, hydrometer readings should be taken during normal floating operation. In the case of cycled batteries, voltage readings should be taken about 15 minutes after stopping the charge.
10. Make periodic complete inspections of the entire battery system. See that all bolted connections are tight.

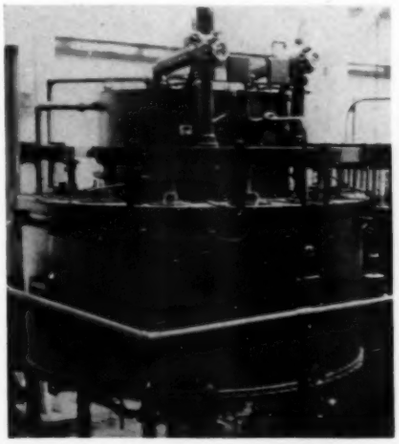
Keep a record card for each cell or battery to ensure the regular performance of a proper maintenance procedure. Parts to be carried in stock are determined by the type, size and number of cells or batteries.

### Rectifiers

A few decades ago motor-generator sets, rotary converters and mercury arc rectifiers were the only commercial means of converting a.c. to d.c. Today rectifiers are available for the same purpose.

Two general classifications of rectifiers are:

1. Hot cathode tube—which may be



*MERCURY ARC RECTIFIER—in metallic tank. This and another here have 12 anodes, and are rated 3,250 kw., 12-phase, 625 volts, d.c. Installation is at Consolidated Mining and Smelting Co., Trail, B.C. (General Electric Co. photo)*

# TROUBLE CORRECTION CHART FOR BATTERIES AND RECTIFIERS

## Storage Batteries

| INDICATION | INTERPRETATION | REMEDY |
|---|---|---|
| All cells uniformly low in specific gravity and voltage. | Probably discharged. | Give equalizing charge. |
| Relatively low specific gravity and floating voltage or relatively low final charge voltage, certain cells. | Internal short circuit in the low cells. | Dismantle element and examine for punctured separator. |
| Same as above plus excessive gassing of negative plates on open circuit. | Excessive local action. | Prolonged charge — in aggravated cases water charge. |
| Relatively low specific gravity but relatively normal final charge voltage. | Loss of electrolyte through spillage or leakage. | Give equalizing charge and gravity adjustment. |
| Excessive amount of water required for flushing. | Excessive charging or leaky container. If leaky container, gravity will also be lower. | Examine for leak. If no leak, reduce amount of charge. |
| Plates of unhealthy color,—positives muddy yellow instead of chocolate brown. Negatives whitish instead of slate gray. | Insufficient charge or internal short circuit. | Examine for short circuit and give prolonged charge. |
| Lack of capacity on discharge. | Worn out positives, (indicated by excessive sediment) or unhealthy negative. | Renew plates (possibly only positives). If positives good, give cells special treatment (prolonged charge or water charge) to improve negatives. |
| Low voltage on high discharge. | Poor contacts between posts and intercell connectors.<br>Cracked or broken positive grids. Worn out or unhealthy plates. | Clean and tighten contacts.<br>Renew plates or give cells long charge to rejuvenate negatives. |

## Rectifiers and Battery Chargers

### Hot Cathode Rectifiers

| | | |
|---|---|---|
| No output.<br>Filament not lighted. | A. C. fuses blown.<br>Burnt out filament.<br>Loose or corroded filament circuit contacts.<br>Open transformer filament winding. | Replace fuses.<br>Replace tubes.<br>Clean and tighten or solder loose contacts.<br>Replace filament transformer. |
| No output.<br>Filament lighted. | D. C. fuses blown.<br>Loose anode circuit connection.<br>Shorted filter condenser.<br>Tube with high arc drop.<br>*Time delay relay not operating. | Replace tube and check circuit for overload.<br>Clean and tighten or solder loose connection.<br>Replace condenser.<br>Replace tube.<br>Clean contacts and check relay operation. |
| Short tube life. | Excessive voltage on filament.<br>Excessive load.<br>*Time delay relay set for too short time. | Change transformer tap or use filament rheostat.<br>Reduce load or change to higher capacity tube.<br>Adjust time delay relay for proper time. |

*Applies to mercury vapor tubes requiring time delay between energizing filament and applying load.

### Dry Disc Rectifiers—Battery Chargers—General

| | | |
|---|---|---|
| No charging current. | A. C. or D. C. fuses blown.<br>Loose or broken connections.<br>Pitted or oxidized tap charger contacts. | Replace fuses.<br>Tighten or solder connections.<br>Clean and adjust rotating arm and points. |
| Fuses blow, either A. C. or D. C. or both. | Excessive charging rate.<br>Battery polarity wrong.<br>Shorted rectifier. | Reduce rate to maximum specified on nameplate.<br>Connect positive of battery to positive terminal of charger and negative to negative.<br>Test according to instructions of manufacturer and replace if necessary. |
| Shorted rectifier. | Sustained overload in voltage or current or both.<br>Inadequate ventilation.<br>Excessive moisture or acid fumes. | Replace rectifier and check rating.<br>Replace rectifier and provide for free passage of air through rectifier enclosure.<br>Replace with rectifier having varnish protection. |
| Battery voltage too low or too high. | Incorrect adjustment. | Change series rheostat or transformer tap changer, if non-automatic. Adjust control rheostat if automatic type. |

### Battery Chargers—High Rate Fan Cooled Type

(Comments under Battery Chargers—General also apply)

| | | |
|---|---|---|
| No charging current. | Fan relay open. | If fan is not operating, check motor for trouble. If fan is operating, check fan relay for friction or broken connections. |

### General Purpose Rectifiers

| | | |
|---|---|---|
| No output. | Fuses blown.<br>Loose or broken connection. | Replace fuses.<br>Check and tighten or solder all connections. |
| Low output voltage. | Low line voltage.<br>Aged rectifier.<br>Shorted condenser (if filter circuit is used). | Change transformer tap.<br>Change transformer tap.<br>Replace condenser. |
| Fuses blow. | Overload in voltage or current or both. | Replace with rectifier or proper rating. |

*COPPER OXIDE RECTIFIER—is part of wall-mounted Rectomatic charger which automatically maintains 24-cell Exide control battery at 51.6 volts. (Westinghouse photo)*

be divided into vacuum tube, mercury vapor, and argon filled (Rectigon and Tungar) types.

2. Dry disc types which may be either of copper oxide (Rectox), copper sulphide or selenium. The liquid electrolyte rectifier which was used widely 15 to 20 years ago is now practically obsolete.

Fundamentally all static rectifiers operate on the same principle. Resistance to current flow in one direction is very low, while in the other direction it is very high. By proper combination of these rectifying units, half-wave or full-wave single-phase and polyphase rectification may be obtained.

The type of equipment for a.c. to d.c. conversion is dependent on a number of factors such as—(1) initial investment, (2) efficiency, (3) maintenance and life, (4) supervision required, (5) space limitations, (6) noise, (7) availability, (8) reliability, (9) regulation, (10) overload capacity, (11) radio interference, (12) power factor. All factors listed do not apply to every application.

Economic or design limitations of rectifiers make them adaptable to the following industrial and commercial uses:

1. *Vacuum and mercury vapor tubes*—for (a) power supply for photoelectric equipment; (b) power supply for electronic regulators and control equipment; (c) radio, television, and telephone equipment.

2. *Argon filled tubes*—for battery charging.

3. *Dry disc rectifiers*—for (a) arc welding; (b) battery charging; (c) business machines; (d) circuit breaker closing and tripping; (e) d.c. contactor operation from a.c. circuit; (f) electric hammers and vibrators; (g) electrical control equipment; (h) electro-plating; (i) magnetic separators, clutches and brakes; (j) motion picture projection equipment; (k) remote metering equipment; (l) signalling and alarm system; (m) solenoid operation; (n) time clocks and time recorders, and (o) in some cases for eliminating battery, battery charger, and battery housing, with reduction in maintenance.

Rating of rectifiers, like other electrical equipment, is limited by the temperature of operation, or by the dissipation of the internal losses.

The rating of hot cathode tubes, either gas filled or vacuum type, is limited by filament emission which is a very large factor in determining life. In dry disc rectifiers, maximum life is obtained by maintaining low operating temperatures.

Equipment with standardized ratings is available for some applications such as battery chargers, rectifiers for control circuits and for time clock systems. Equipment is tailor-made for many other applications such as electrochemical processes, mine and railway service.

The size of rectifier to be used is determined by the load requirements. Ratings should never be exceeded for continuous service.

Half-wave, single-phase rectifiers are used mainly in battery charging equipment, also with control equipment for polarizing relays, and special applications such as electric hammers and vibrators. For other types of load, the wave shape is unsatisfactory and full wave is specified.

### Rectifier Maintenance

Motor-generator sets used for conversion of a.c. to d.c. require the same type of maintenance and inspection as the a.c. and d.c. motors covered earlier in this series of Maintenance Guide Sheets. But small rectifiers require almost no maintenance, except for an occasional inspection, and occasional replacement in the case of hot cathode tubes. However, the following care should be provided:

1. High output, fan cooled rectifiers have fan motors, generally ball bearing type, which will require lubrication not oftener than once a year.

2. Contactors in control and power circuits may require cleaning and inspection once or twice a year.

3. Protection against overload is usually provided by fuses in the a.c. supply to the rectifier. In the case of battery chargers, the d.c. circuit also is fused to prevent feedback in case of a.c. power failure.

4. Rectifiers must be located so that ventilation is unimpeded. Disc temperature should not exceed 125 deg. F. Dry disc rectifiers, in particular, must not be exposed to excessive moisture or acid fumes, unless specially treated.

5. The size of leads for the rectifier can be determined from the current rating and wire tables. In low voltage installations, use the table listed in *Electrical Contracting*, February 1939, page 50.

6. Spare parts of rectifier assemblies ordinarily stocked are fuses, and replacement tubes for the hot cathode type rectifiers. Some users of copper sulphide dry disc rectifiers consider stocking of spares essential.

7. In trickle charging of batteries, readings of charging current and battery voltage should be recorded at inspection periods. Records of life of hot cathode tubes are made sometimes, and of copper oxide rectifiers, seldom. Connection diagrams of rectifiers should always be filed for ready reference.

### Battery Charging

For charging batteries use only direct current, never alternating current. When d.c. is available proper charging current is usually obtained by the use of resistors. In most cases, of course, the a.c. system is used converted to d.c. by a rectifier. Two methods of charging are commonly employed—the cycle charge and the trickle charge.

*The cycle charge* is used mainly for portable batteries. Charging is done after the battery is partially or completely discharged. The battery is taken out of service and completely charged at a high current rate.

*The trickle charge* method is used widely for stationary batteries. The charger is operated continuously at such a rate that over long periods it delivers to the battery the energy taken by the load plus losses in the battery.

To select a suitable charger, the following points should be considered:

1. Ampere-hours supplied by battery per day.

2. Stationary or portable use of battery.

3. Frequency and length of charging periods.

4. Supervision available.

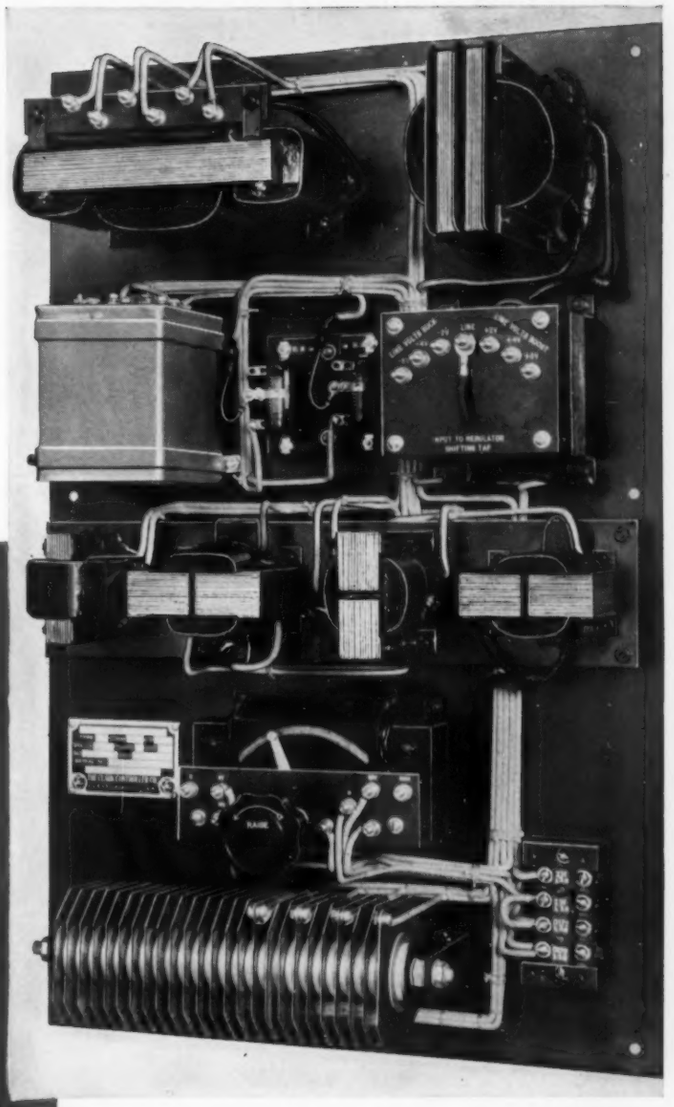
5. Steps of charging rate available.

The charger size may be calculated from the following formula, using the factor 1.25 to take care of battery losses: *Charging rate is equal to ampere-hours demand from battery multiplied by 1.25 and divided by the hours available for charge.*

Final voltage on charging varies with specific gravity and height of the electrolyte, and the design and composition of plates and separators. Completion of charge is most reliably determined when a number of identical readings of maximum voltage and specific gravity are obtained.

Several types of battery chargers, employing Rectigon and Tungar tubes, copper oxide rectifiers, and m-g sets, are available for both cycle charging and trickle charging. When a charger installation is considered, recommendations should be obtained from reputable manufacturers of batteries and battery chargers.

# Voltage Regulation? The "Yes and No" about the Clark Bulletin 4000 Autovolt Regulator



**Yes!** Operation is entirely Automatic.

**Yes!** Regulation starts immediately.

**Yes!** Constancy of output voltage is maintained.

**Yes!** Accuracy is very high.

**No!** There are no moving parts.

**No!** There is nothing to wear.

**No!** There is no maintenance, nor replacement.

**No!** There is no wave form distortion.

**YES!** *A fully descriptive folder is yours for the asking. Just ask for Bulletin 4000.*

## EFFICIENCY

**Approximately 95%—Varies with size and loading of regulator.**

## RESPONSE

**5 cycles for maximum load change. 14 cycles for maximum line voltage change.**

## ACCURACY

**Plus or Minus ½ of 1% is standard. Greater accuracy is available on special order.**

## WAVE FORM

**No distortion of wave form.**

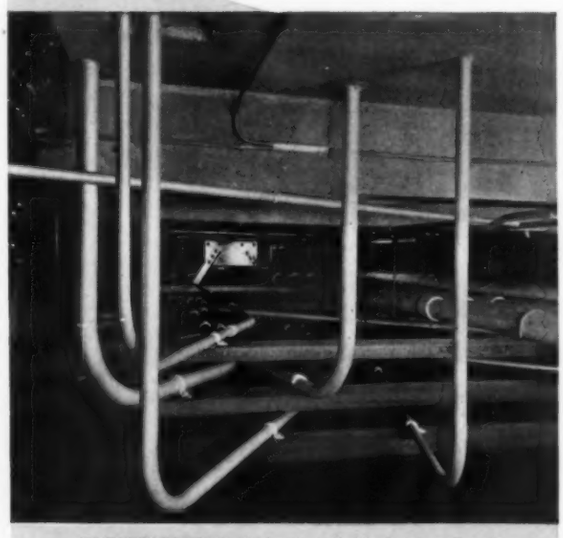
OFFICES IN PRINCIPAL CITIES

**THE CLARK CONTROLLER CO.**

1146 EAST 152ND ST. CLEVELAND, OHIO

# New Public Utility P

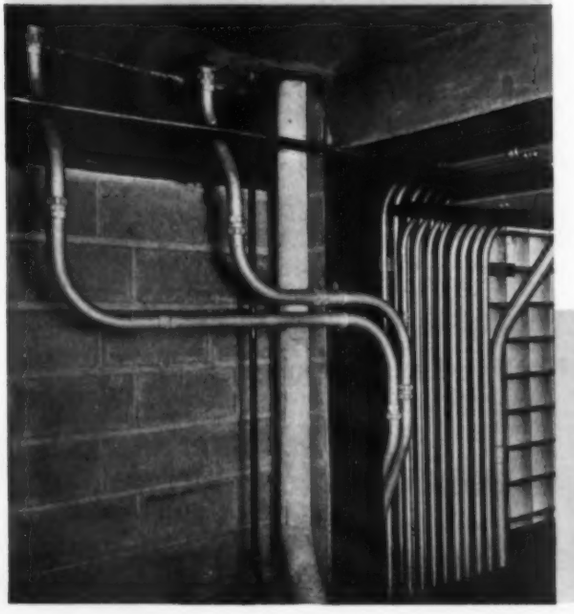
# STEELTUBES INC



*ELECTRUNITE Steeltubes installed in balcony directly above the turbine room which contains two 15,000 k. w. turbines, one 12,500 k. w. turbine and one 5,000 k. w. turbine.*

• • •

*ELECTRUNITE Steeltubes control conduits on balcony under switch gear floor. Because there are no cut threads, Steeltubes provides an unbroken continuity of rust-resisting galvanized surface throughout the installation.*



You don't have to take our word for it! Millions of feet of ELECTRUNITE Steeltubes installed in concrete prove that this original electrical metallic tubing is ideal for concrete construction — that it is safe, strong, watertight and uniformly resistant to corrosion throughout the entire system. 60,000 feet in sizes ½-inch to 2-inch, inclusive, recently installed in this new Indianapolis Power & Light Company plant adds to that proof.

Nor need you take our word for the ease of installation of this modern threadless steel conduit. Men who have used it will tell you that it takes much of the arm-ache and back-break out of installation work.

The superintendent of electrical construction for the contractors on this utility plant, who has supervised electrical construction for 18 years, says: "It is my firm belief that Steeltubes is much easier to install. This was the first installation of Steeltubes that our crew ever put in, but they had no trouble making accurate bends and now prefer working Steeltubes to other conduit."

Learn for yourself why so many jobs are being wired in ELECTRUNITE Steeltubes. Use it for your next job—whether exposed or in concrete. It will quickly demonstrate why you should continue to use it.

*Look for this label. It is found only on genuine ELECTRUNITE Steeltubes.*

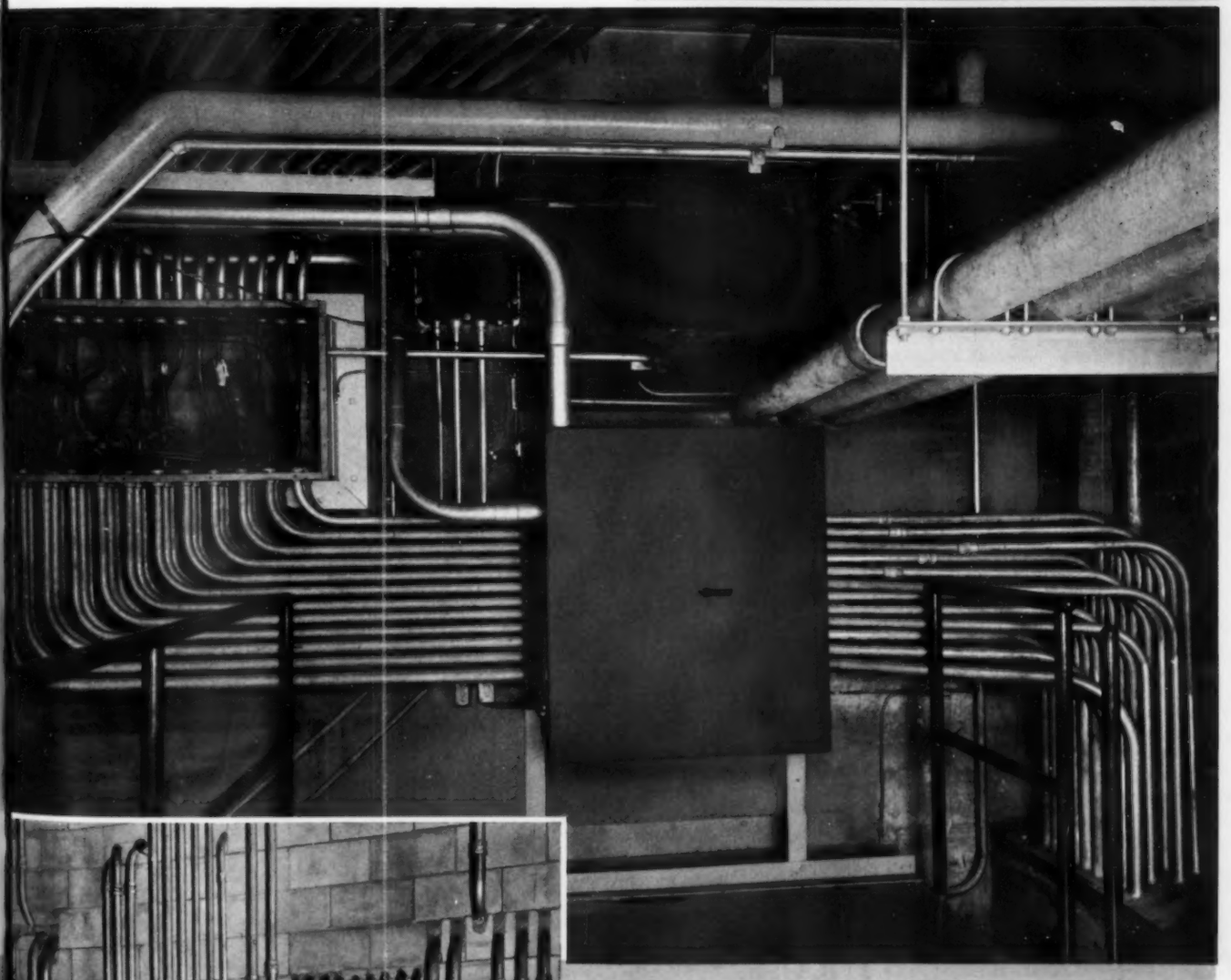
UNDERWRITERS' LABORATORIES INSPECTED
ELECTRUNITE
REG. U.S. PAT. OFF.
RIGID
STEELTUBES - B
PAT. NOS. 1388434, 1435306, 1962876
N-57
ELECTRICAL METALLIC TUBING

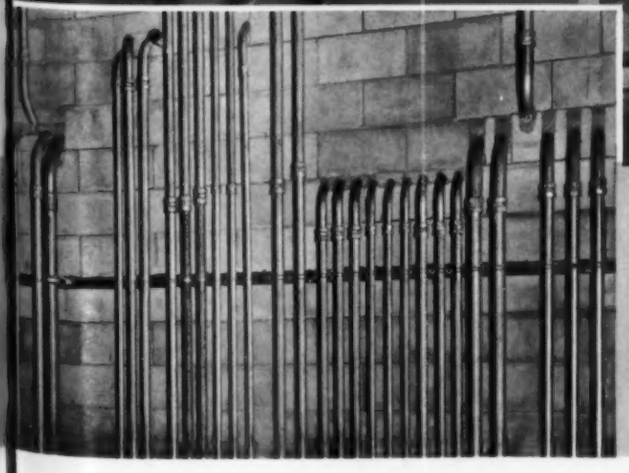
**Steel and Tubes, *Inc.***
**CLEVELAND . . . . OHIO**

**SUBSIDIARY: REPUBLIC STEEL CORPORATION**

# t Plant uses... CONCRETE!

*C. C. Perry plant, Section K, Indianapolis Power & Light Company, Indianapolis, Indiana.*





**Above:** *Look at the neatness and uniformity of the bends in these auxiliary control conduits in turbine room basement. They run from the switch gear balcony down through turbine room basement to switch house across Kentucky Avenue. Any type of bend is easily and accurately made on the job with ELECTRUNITE Steeltubes.*

• • •

**At left:** *ELECTRUNITE Steeltubes on south wall of boiler room firing floor. Note the compression-type couplings which eliminate thread-cutting and turning the line—which make positive, watertight joints easily and quickly.*

## Staff In and Out Systems

The maintenance of staff in and out, low-tension signalling systems is a simple matter compared to other signalling systems. After all, they are merely an adaptation of lamp circuits, made up into the form of annunciators and elaborated upon to meet specific administrative requirements. They include in most cases the well known single pole and three-way switches.

As an example, a simple entrance register makes use of a single pole switch to operate an individual or associated lamp. When such a system includes an office indicator, it simply means that an additional lamp annunciator is used having an extension lamp connected to each lamp in the entrance register. The operation of an individual tumbler switch therefore, will operate its associated lamp in the entrance register and its extension lamp in the office indicator.

In most cases these lamps are connected in series, while in other systems they are connected in parallel. The series system is preferred because of its inherent piloting value, which assures the signal being sent to all points.

When registers are required at two entrances, the lamps are controlled by means of three-way switches. Here again the lamps are connected in series or parallel. However, the circuit connections of the three-way switches in these systems may vary.

In some of the older systems, the three-way switches are connected together with two traveler wires, in the same manner as for lighting circuits. Most of the later systems bring two sides of the feeder wires directly into the open side of the switches. In this method of wiring, the lamps are connected in either series or parallel, with a single wire connecting the shunted sides of both switches.

The messenger signal feature is often incorporated with either of the above systems. It consists of a switch in the office indicator alongside of each lamp. It is wired to operate an additional distinguishing lamp alongside of each register lamp. In some of the recent systems, however, only one lamp is used in the entrance register for both registering and message purposes.

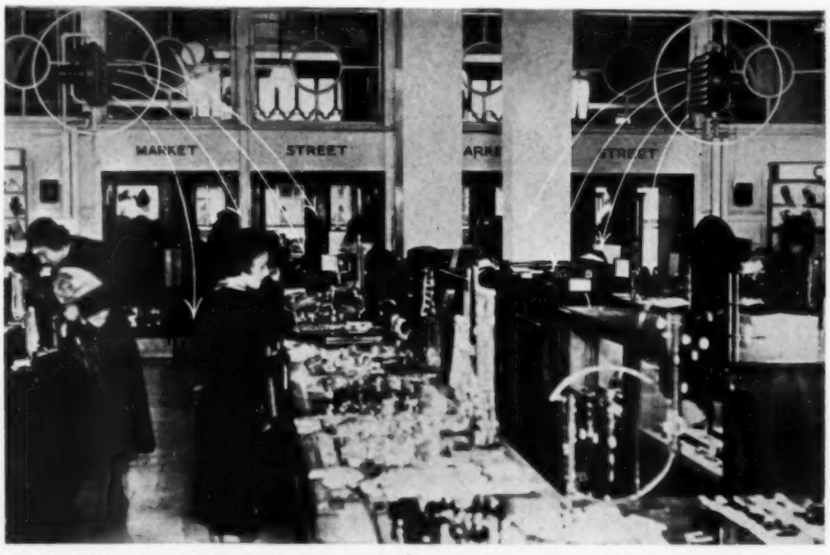
When this method is followed three-way switches are used in lieu of the single pole message signal switch, with a motor-driven flasher. The lamps are steady for registration, but flash when a message signal is to be indicated.

## Cold Drafts Eliminated

At Lit Brothers Department Store, Philadelphia, a large area near the door was uncomfortably cool in winter. This was quite noticeable on bargain days when the doors were continually opened and closed. The problem was to prevent cold air entering the large swinging doors.

Unit heaters were placed inside of the door-way and warm air directed to the floor in front of the doors. This provided a curtain of warmth.

Where there was heavy traffic at other doors unit heaters were mounted in the partitions between the store and the vestibule. Air was taken from the store, warmed and discharged into the vestibule. There a pressure of warm air was created, which prevented cold air entering the outside door.




*CURTAIN OF WARMTH—Two unit heaters direct warm air in front of doors, and provide comfortable shopping and working conditions in the immediate area inside the store (Ilg Electric Ventilating Co. photo).*

## Transformers At Load Centers On Lighting System Save 40 Per Cent

An advance in distribution system practice is reported to have been made at the Pittsfield, Mass., plant of the General Electric Co. Pyranol transformers were installed at strategic distribution centers to obtain adequate power for properly lighting a new production layout. The installation is the reverse of the story of the "Shoemaker's Children."

In the old system of distribution, some lampsockets were as far as 600 ft. by wire from the outdoor location

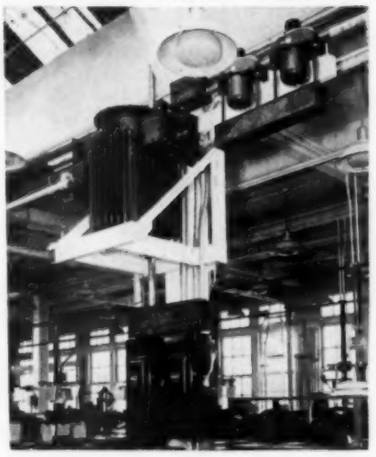
**ABOVE WORK AREA**—*Pyranol transformer, rated 100 kva., 2,300 to 115/230 volts, and an air-cooled regulator, rated 12 kva., 240 volts. Another load center installation supplying lighting circuits in Pittsfield Works of General Electric Co.*

of the oil-cooled transformer substation. The sockets had been wired for 100 watts per outlet. In many cases the conduit would permit no increase in size to bring the lighting up to modern standards of 500 to 750 watts per outlet.

A new distribution system was obtained (1) by cutting the previously used secondary feeder into three sections, (2) installing a Pyranol transformer at the middle of each section and (3) running in exposed conduit a new 2,300-volt primary feeder to supply the transformers.

The desired illumination, requiring six watts per sq. ft. of working area required to attain a level of 25 to 30 foot-candles, was obtained with the new system at savings of approximately 40 per cent over systems using conventionally located transformers of the oil-filled type.

Utilization of existing secondary copper and conduit accounted for the bulk of the saving. This was made possible by using transformers filled with the non-inflammable and non-explosive Pyranol, which could be located indoors at the load centers. In addition to the saving, this arrangement permits a fur-



**DISTRIBUTION** *at the load center for lighting. The 2,300-volt single-phase line comes to the Pyranol transformer (mounted on elevated rock), rated 100 kva., through oil fuse cutouts (right). Secondary is connected to two 400-amp. Trumbull safety switches, each controlling the supply to Trumbull multi-breaker load centers in the two halves of illuminated area.*

ther increase of 50 per cent in lamp size when and if needed.

Further insurance of adequate lighting voltage supply through the transformers has been provided by the installation of voltage regulators. Thus, illumination is held at proper levels regardless of variations in the lighting load, or in the power load supplied from the same primary bus.

Two other plans were considered but were rejected because of costs. One plan was to increase five-fold the size of the existing 2,300–230/115 volt transformers at the substation, abandon the conduit runs and feeders imbedded in the building structure, and run large exposed conduit. The cost for this arrangement was prohibitive.

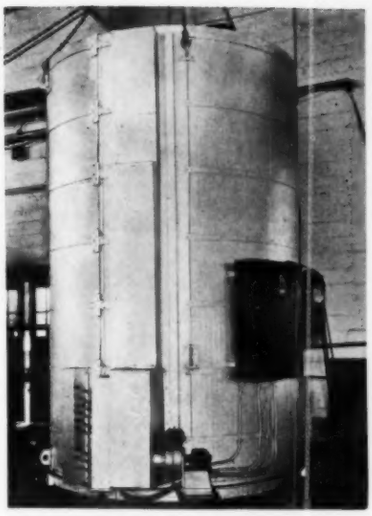
The other plan involved the installation of a transformer at the center of the load distribution, and using the existing conduit for a 2,300-volt feeder. This plan would have permitted smaller size secondary runs, but the cost was excessive.

## Business Increased By Electric Oven

An unusual enamel-finish problem was solved recently by F. W. Young, Works Manager, and F. W. Van Bolten, Assembly Superintendent, at the Condit Works of Allis-Chalmers Mfg. Co. New designs and particularly government specifications called for a baked, rather than an air dried, enamel-finish on outdoor electric circuit breakers.

To get this business meant designing an oven that was flexible, portable and accurate in temperature control. A flexible oven was needed because on both small or large tanks, and housings and frames of circuit breakers enamel has to be baked evenly. The oven had to be portable to permit baking of work that is difficult to move at the production line. To make the oven accurate in temperature control

**THE "OK" LINE** *at Plymouth automobile plant, Detroit. Here finished cars are given a thorough inspection before delivery. Lighting is an all important factor. High intensity mercury vapor lamps in reflectors are mounted on 12-ft. centers and provide a light intensity of 72 foot-candles*



IT'S A 50-KW OVEN—*Flexible, portable, and accurate in temperature control for baking enamel finishes on parts which are difficult to move at the production line.*

meant utilizing enamels with critical baking temperatures.

How these problems were solved is shown in the finished job. One hundred strip heaters, each rated 500 watts, are distributed around the bottom duct. Four inches of asbestos magnesia keeps the heat inside. Adjustable louvers and a recirculating air blower provide even heat. A thermostat controls the temperature, usually 250 deg. F., within 10 deg. of the setting.

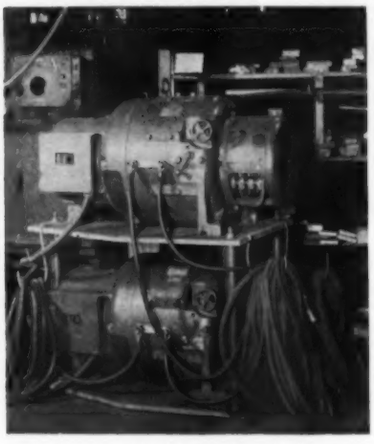
The oven is built in two half-cylinders, hinged along one edge and provided with bolts for tight closing, along the other edge. It is mounted on roller bearing wheels and can be opened and closed easily. A hole in the top, with removal cover, provides for removal of volatiles. A crane can hook onto welded lugs and carry the 5,000-lb. baker around the shop. Power circuits are available every 25 ft. along the factory floor for connections to the oven.

Results—(1) Production is increased because three coats can be baked in 10 to 15 hr. as compared to 24 to 48 hr. for drying of one coat of enamel (2) baked finished stands up better (3) handling for enameling operations is much less than with other schemes; (4) cost of heating is low because the heat is applied efficiently; and the Boston Edison electric rate is attractive. And (5) best of all, the method is satisfactory and economical, resulting in more business having been obtained.

## Stand For Welders Saves Space

Sometimes the convenience of single-operator welding sets is restricted because of limited floor space. By using a

stand and by mounting one set above another, the required floor space is reduced 50 per cent; also an orderly welding section can be maintained. The stand for the welding machines may be placed adjacent to a wall or between two columns, thereby eliminating an indiscriminate arrangement of single machines on the welding floor.



**SPACE SAVING**—*Two-high stand reduces by one-half the floor space ordinarily required by the welders. The stand can be fabricated in the shop and at a nominal cost. (Westinghouse photo.)*

The stand for the welding machines can be made at a nominal cost. It is easily fabricated from steel plates one inch thick, some three-inch pipe, and thru-bolts with nuts. Stands may be made three-high, but a two-high stand is more convenient for the operator.

## Air-Cooled Transformer Applications

In order to obtain satisfactory results, equipment must be operated at the voltage for which it is designed. Sometimes a lower or higher voltage than can be supplied by the plants power circuit is required. In such instances, transformers of the air-cooled type can be used. Often they can be placed adjacent to the equipment.

The following applications of air-cooled transformers may give an idea for the solution of some maintenance problem.

(1) Stepping-down voltage for portable tools, lamps, floor scrubbers, signs, air circulators and exhaust fans, vacuum cleaners, small pumps and compressors, glue pots, and soldering irons.

(2) Changing from two to three phase or three to two phase.

(3) Providing power for control, signal, lighting and telephone circuits which are insulated.

(4) Stepping-up voltage for operating a small 240-volt motor on a 120-volt utility or lighting circuit.

(5) Boosting voltage to correct for voltage drop in plant wiring, or to operate 220-volt motors on 199-volt network.

It is well to investigate local codes and regulations of the power company. The latter may require special protective equipment with air-cooled transformers, which might cause the total cost to be excessive.

## Provide Drainage for Underfloor Conduits

Extra precautions should be taken to avoid loose couplings, traps or pockets when conduits are installed in concrete floors, wherever frequent moppings will occur. Though there is no possibility of permanent moisture seepage on the above-ground floor levels, daily moppings can saturate the tile and concrete sufficiently for moisture to become trapped inside some conduit runs. Premature insulation failures will be experienced, particularly on telephone and signal conductors.

George W. Bicknell, chief electrician for the John Hancock Mutual Life Insurance Company building in Boston, cites such a case. In one year it was necessary to replace telephone conductors four times because of moisture damage, although each time the conduits were swabbed dry before new wires were installed.

*CONVENIENT—Here is a demonstration of how one plant furnishes utilities in its fabricating shop. Directly under the cabinet four convenience outlets provide electric power for extension lights and portable tools. At the side of the cabinet is a heavy-duty socket for a welder connection. Also air, gas and water connections are available at the side of the column. The chain is for mechanically operated ventilators near the roof.*

## Get the Most Out of Spares

MOST operating men have been shrewd enough to protect their production by purchasing an adequate stock of parts and spare equipment. Following are suggestions to help make these spares serve their purpose:

1. Tag and catalog all parts so that they can be quickly identified.
2. Leave all anti-friction bearings in their anti-rust package.

## MIKE'S MAINTENANCE MANUAL

**By J. M. Zimmerman**

*Service Division, Westinghouse Electric & Manufacturing Company, Chicago, Ill.*

3. For quick identification use dust-tight glass containers wherever possible for small items.
4. Insulated coils should be refreshed by a coat of thin baking varnish every two or three years.
5. Insulated coils should be wrapped in oil paper to keep out moisture and dirt.
6. Mica which must be kept flexible should be stored in a container having an alcohol humidifier in the base.
7. Spare motors and armatures should be repaired before storing in a dry, clean place.
8. Spare armatures should be wrapped with oil paper and put in a steel cylinder container which has been cut in half to facilitate packing.
9. Spare motors and armatures should not be allowed to stand idle more than three years at a time before being put into service. Then those being removed should be cleaned and re-impregnated.

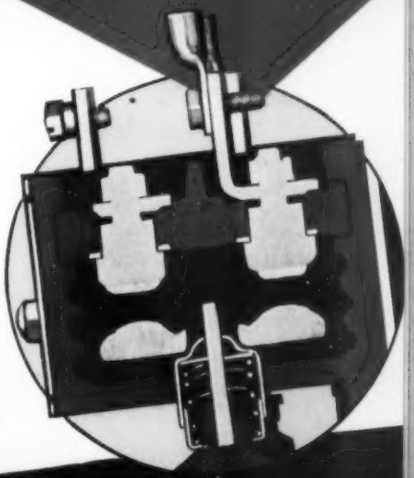
## The Secret of ALLEN-BRADLEY Current Interrupting Capacity

This cross-sectional view of the contacts shows why high currents are so easily disrupted. (1) The double break contacts cut the voltage on each contact in half. (2) The arc gap is set for the most effective current interrupting capacity. (3) The patented silver contacts contain cadmium which has a deionizing effect. Allen-Bradley solenoid starters will easily disrupt currents of not less than ten times their maximum horsepower rating.

# "That switch disrupts every other arc so now he's trying lightning!"

Lightning may be a little too much for the Allen-Bradley solenoid starter, but try this starter on your motor control circuits! No matter what your motor load conditions may be—full load, overload, or locked rotor—here is a starter that will easily handle them. Arcs are quickly snuffed out, reducing the possibility of contact burning.

Furthermore, you never have to clean or file the double break, silver alloy contacts on Allen-Bradley solenoid starters. These starters can be installed and then forgotten. Their simple construction is a guarantee of the absence of trouble. Installation is unusually easy, too. Available in three ratings and seven types of enclosing cabinets. Specify Allen-Bradley solenoid starters on your next control job.

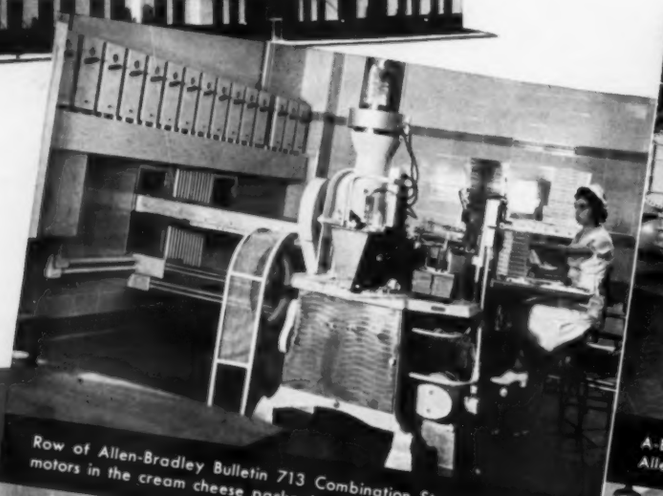


# ALLEN-BRADLEY
## SOLENOID MOTOR CONTROL

QUALITY

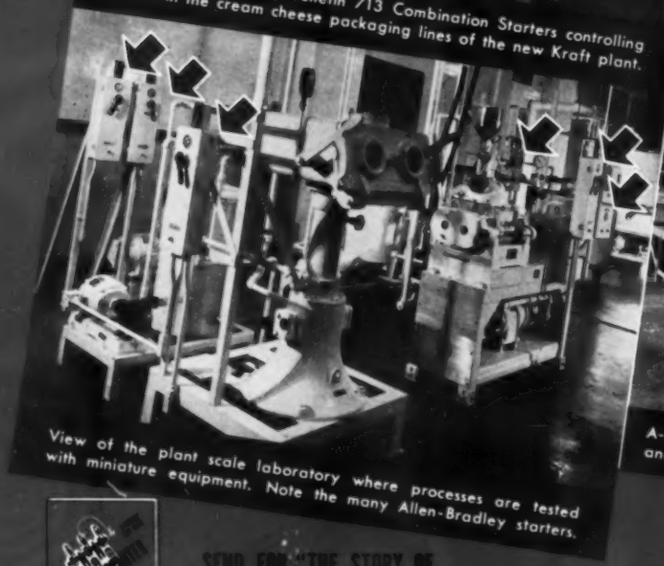
# HOW KRAFT
## automatically controls the motors in their new Chicago plant


**You will find Allen-Bradley solenoid starters and push button control stations on all of the important production lines in the new international headquarters building of the Kraft-Phenix Cheese Corporation, in Chicago. These Allen-Bradley starters are as modern and efficient as every other part of this fine new plant. They were selected on their record of performance in other Kraft plants. Specify Allen-Bradley control for *your* motors.**

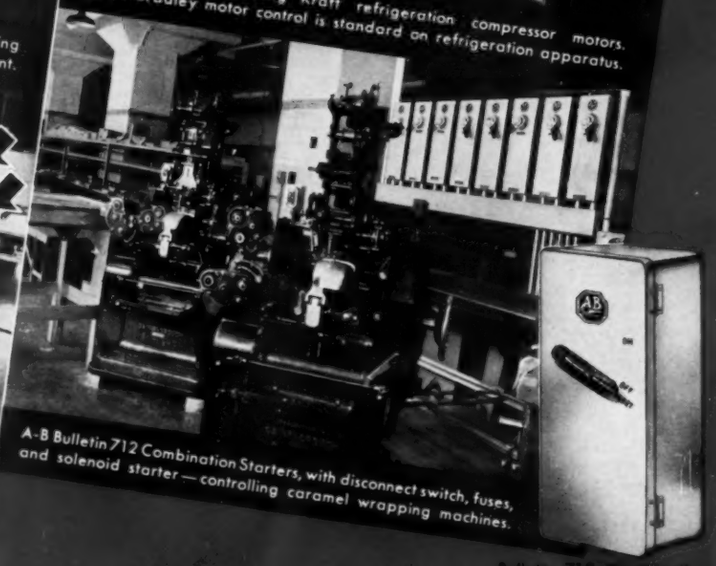


Row of Allen-Bradley Bulletin 713 Combination Starters controlling motors in the cream cheese packaging lines of the new Kraft plant.

A-B starters controlling Kraft refrigeration compressor motors. Allen-Bradley motor control is standard on refrigeration apparatus.



View of the plant scale laboratory where processes are tested with miniature equipment. Note the many Allen-Bradley starters.



A-B Bulletin 712 Combination Starters, with disconnect switch, fuses, and solenoid starter — controlling caramel wrapping machines.


SEND FOR "THE STORY OF THE SOLENOID STARTER"

Allen-Bradley Company
1307 S. First Street
Milwaukee, Wisconsin

Please send me "The Story of the Solenoid Starter.

Name.....

Company.....

Address.....

City.....State.....

Bulletin 713 Combination Starter with special

# ALLEN-BRADLEY
## SOLENOID MOTOR CONTROL

## Selling Instrument Service

[FROM PAGE 18]

horn. Metering circuits were extended from the service entrance to the board and connected to the wattmeter. The graphic meter provides a continuous record of plant demand for scheduling machine operations and any other management analysis necessary.

The contact making wattmeter is set for the predetermined maximum demand, 170 kw., and actuates a time delay relay when the load is exceeded. The relay consists essentially of two synchronous motors, one running clockwise and the other counter-clockwise, actuating an indicator and a contact making device.

### How It Works

In operation, when the load exceeds 170 kw. the wattmeter operates the clockwise movement in the relay, stepping the indicator ahead toward a pre-set contact. When the load continues high for fifteen minutes, (or any other pre-set time) the relay operates a warning horn and light. A switch provides means of cutting off the horn. With this warning the superintendent has ample time to check the machinery and lighten the plant load for a few minutes until the loaded machines return to normal.

This job is typical of the kind of service we give the industrial customer through instrumental analysis. It can be applied to other conditions also, where a load limiting device can be made to automatically remove heavy loads for the duration of the peak and return them when the peak drops to a safe level.

### Other Economies

Motor to load balance is another important money saving service that we sell with instruments. Manufacturers of machinery almost universally overpower their jobs. This is natural enough, as they cannot determine the kind of service to be met in the individual plant, so they set motors big enough for all contingencies. In the plant, however, such over-powering spells low motor efficiency and bad power factor. Therefore, we advise our customers to buy machinery without the motor and set up a test with a stock motor to assure an exact fit under their own running conditions.

Power factor correction is often advised by equipment manufacturers and power company salesmen. Our analysis shows the customer whether he needs it and where to apply it. As a rule, we advise power factor correction at the point of reactive load, rather than setting up blocks of condensers at the switchboard for system correction. Heavy correction on the service will create a leading power factor when some of the reactive load is dropped which is just as bad as the lagging power factor the equipment is supposed to correct. Point of load power factor correction also increases the capacity of the wiring system and lowers line losses.

Our experience with this type of service, covering only a few short months, has proved to us that it fills a real need in industry and the possibilities are yet to be thoroughly explored. Of course, instruments of the highest quality are needed to guide such an analysis and the data they provide must be skillfully interpreted and correlated with the realities of plant operations.

HIGH DEMAND *warning board installed in a rubber plant after instrument analysis. It warns the superintendent when the predetermined maximum demand is about to be exceeded. The warning comes in ample time to reduce load.*

## Passing Them Around

Twenty-nine contractors of Jacksonville, Fla., shared in 1266 range and water heater wiring jobs during the first ten months of 1938. When the city-owned utility gets a new domestic cooking customer, the wiring order is passed on to the local association's office, where a system of job rotation is maintained to pass such jobs around to its members. Range and water heater wiring averages $35 in Jacksonville, range only $27.50, and water heater only $7.50.

# Estimating

## Wiring Costs for a One-Family House

To get up-to-date facts about what it costs to do house wiring, Joseph J. Tomasulo & Co. of Roselle Park, N. J., recently prepared a detailed record of the actual cost involved to wire a 6-room frame house. We have condensed this company's data so it could be presented for study and comparison by other contractors who may be interested in this class of work.

The home was a 2½-story frame structure, 29 ft. by 37 ft., with 6 rooms, bath, attached garage and unfinished cellar. Armored cable was used for the four branch circuits, and ¾-in. rigid conduit and 3 No. 8 conductors for the service. These outlets were installed—

13 single pole switches
4 three-way switches
21 duplex receptacles
1 pilot light receptacle
13 lighting outlets
1 radio receptacle
1 combination bell and buzzer
2 push buttons
1 bell transformer
410 feet of 2-wire and
220 feet of 3-wire cable were used for the circuit wiring. Labor only for installing fixtures.

The final costs for this job ran—

| | | |
|---|---|---|
| Labor— | | |
| Journeyman Scale | $13.20 per day | |
| Apprentices | 6.60 per day | |
| Roughing, 18 hrs. | 29.70 | |
| Finishing, 8 hrs. | 13.20 | |
| Service, 6 hrs. | 9.90 | |
| 32 hrs | | $52.80 |
| Material— | | |
| Roughing | $25.70 | |
| Finishing | 10.24 | |
| Service | 8.82 | |
| | | $44.76 |
| Inspection Fees | | 8.00 |
| Insurance on labor 8% | | 4.22 |
| Total Cost | | 109.78 |
| 10% and 15% overhead and profit | | 29.07 |
| Total Price | | 138.85 |

Cost of Labor .....46%
Cost of Material .....32%
Fees, Overhead and Profit.....22%

Deducting a total cost of $19.51 for the service, consisting of $9.90 for labor, $8.82 for materials and $0.79 for insurance, from $109.78, the outlet work actually cost $90.27 for roughing and finishing. By including bell work and radio as three outlets, there are 55 outlets in this home, averaging a cost of $1.64 each. Including the service costs, these 55 outlets averaged $2.00 in cost and a selling price of $2.52 each.

## COSTS ON TRANSFORMER VAULT WIRING

The installation of primary equipment and secondary connections for a battery of 2 single phase 50 k.v.a. power transformers, 3 single phase 100 k.v.a. lighting transformers and 1 three phase emergency transformer in a vault on a large auditorium job furnished the opportunity for the following time study material. The data is taken from accurately kept daily time sheets showing the distribution of each man's time over each operation.

1. *Setting and connecting metering transformers*—Includes mounting on bolts placed through a concrete wall and connections to primary bus. There were 2 pot. transformers and 3 current transformers.

Total time—20.75 m.h.
Per transformer—4.15 m.h.

2. *Primary pipe framework*—Frame was built and stub ends fitted through the deck with floor flanges before concrete was poured. There was used 330 feet of pipe.

Total time—46.25 m.h.
Per foot—.14 m.h.

3. *Primary bus*—This was tubular bus run on insulators. Elbows were formed with a pipe bender. There was used 150 ft. of bus.

Total time—15.5 m.h.
Per foot—.103 m.h.

4. *Secondary bus*—Includes fastening on insulators, drilling and cleaning for lug and clamp connections. There were 67 ft. of ¼x3 double bus, 10 ft. of ¼x3 single bus, and 36 ft. of ¼x2 double bus making a total of 217 ft. of bus.

Total time—21 m.h.
Per foot—.097 m.h.

5. *Miscellaneous work*—Includes time getting measurements for equipment, getting material together and the time of workman on small cleanup job. This is a particularly important item on jobs of this nature.

Total time—50.75 m.h.

6. *Grounding transformers and pipe frame*—Includes running the ground wire through the concrete wall and bringing it out near parts to be grounded. A No. 4 bare copper wire was used.

Total time—16.5 m.h.

7. *Flashboard*—Special brackets were made to hold the flashboard where the clamp tee fittings interfered. A 1½ in. U bolt is used around these fittings and a 1¾ in. U bolt on the regular frame work with regular angle iron. There were a total of 30 flashboards.

Total time—39 m.h.
Average per board—1.3 m.h.

8. *Taping primary bus*—This operation involves taping 150 feet of tubular bus and taping over sleeve connectors and three tee connectors. The bus was taped three times with ½ lap of oil linen and once over with white cotton ½ lap. The job took 50½ lb. rolls of ¾ in. oil linen tape.

Total time—65 m.h.
Per foot of bus—.432 m.h.

9. *Secondary insulators*—Includes fastening the insulators on framework and tightening bolts. These bolts were very tight and were hard to manage as the nut had to be turned up with wrenches all the way. There were 28 insulators in all.

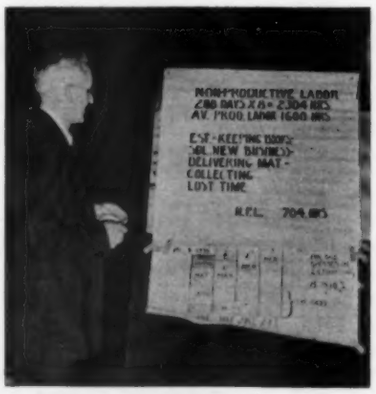
Total time—10.25 m.h.
Per insulator—.366 m.h.

10. *Primary insulators*—There was a total of 39 insulators, 12 of a special type that bolted on a channel iron. Channel irons were bolted on the ceiling of the vault on inserts previously placed in the slab. The other 27 insulators were standard on wood top pins.

Total time—9.5 m.h.
Average per insulator—.244 m.h.

11. *Fuse cutouts for transformers*—They were mounted on the pipe framework and had to be drilled for ½ in. machine bolts. There were a total of 13 cutouts for the five transformers.

Total time—7 m.h.
Per cutout—.54 m.h.




*OVERHEAD CONTROL is no mystery to R. R. Knoerr of Milwaukee, Wisconsin. In a clear explanation illustrated by simple charts he explained the all important item of non-productive labor to the State meeting of the Wisconsin Electrical Association held in Milwaukee.*

## Estimating

[FROM PAGE 52]

12. *Taping primary bus*—Two coats of orange shellac and one coat of a non-metallic red paint. This paint has an analine dye in it for color. The job used one gallon of shellac and one-half gallon of red paint. The paint was applied to all 5000 V conductors which totaled 233 feet.

Total time—28.75 m.h.
Time per foot—.123 m.h.

13. *Disconnect switches*—The bolts for mounting these disconnects were inserted in the form so it was unnecessary to drill for lead anchors. There were three disconnects.

Total time—8.5 m.h.
Average time each—2.8 m.h.

14. *Connecting cutouts to bus*—Fireproof braid 5000 volts VC 1/0 wire was used for this work. Wires were clamped at the fuses and placed in lugs on the bus. A total of 49 ft. of wire was used and there were 13 connections.

Total time—24 m.h.
Average per connection—1.85 m.h.

15. *Painting 1¼ in. pipe ironwork*—Inside aluminum paint was used for painting the framework. The job took about ½ gallon.

Total time—18.5 m.h.
Average time per foot—.056 m.h.

16. *Connecting transformer primary to fuses*—There were 15 connections for six single phase transformers and one 3 phase transformer.

Total time—22.75 m.h.
Average time per connection—1.5 m.h.

17. *Hooking transformer secondary to bus*—Included connecting only the three lighting and three power transformers to bus making a total of 12 legs to connect. Lighting was connected with four-800,000 CM cables per transformers. Power was connected with two No. 1 RC per transformer.

Total time—19 m.h.
Average per connection—1.58 m.h.

18. *Taping secondary bus*—Included taping 24 feet of bus omitting the supporting insulators. Fish paper was used around the bus at the insulator which made a very neat job when clamped in place and the tape lapped over. Taping consisted of one layer of linen, ½ lap and one layer of cotton ½ lap.

Total time—5 m.h.
Average per foot—.21 m.h.

19. *Painting secondary connections*—Included painting the wires from the bus to the secondary leads out of the transformer also the leads. All wires were first shellaced and then red implement paint colored with analine die was used. A total of 118 feet of secondary connections used 1 quart shellac and 1 quart red paint.

Total time—11.05 m.h.
Average per foot—.098 m.h.

*(From A. F. Gould, Central Electric Company, Battle Creek, Mich.)*

## WHEN TO USE POWER DRILLS

It is often necessary to figure comparisons between hand and power tools on tough jobs, to keep in the running. In estimating an industrial rewiring job a large amount of drilling of concrete floors and brick walls was necessary for installing new feeders to panelboards and scattered power equipment. The building was vacant and its old generators had been dismantled. It became a question whether to figure on hand drilling, or to include the cost of a temporary a.c. service for electric power drilling; or to include a rental allowance for an engine-driven air compressor and concrete drilling outfit.

The schedule of holes to be drilled, and the comparison in estimated labor cost was—

The total cost for cutting and drilling was estimated at $1652 for hand labor and $1247 for power labor. These costs were based on an average cost of $1.00 per hour for drilling crews. Here was an estimated difference of $405 if power equipment was provided, out of which to pay rental charges for the air drilling equipment or to cover the cost of temporary wiring, power bills and maintenance for a.c. tools. Since the work was considerably scattered over a rambling floor layout, the use of air drilling equipment was decided upon, and $150 was saved.

In deciding to employ rented air compressor equipment, due consideration was given to the length of time for which rentals would be charged, also the accessibility of floor areas. The accessibility of power and the need for more portable working equipment gives the preference to electric drilling tools.

**Comparison of Hand and Power Drillings**

| No. Holes | Size Conduit | Condition | With HAND LABOR Unit | With HAND LABOR Total Hrs. | With POWER TOOLS Unit | With POWER TOOLS Total Hrs. |
|---|---|---|---|---|---|---|
| 46 | 3" | 8" concrete | 3.75 ea. | 172.50 | 2.80 ea. | 128.80 |
| 93 | 2½" | 8" " | 3.50 ea. | 325.50 | 2.62 ea. | 243.66 |
| 32 | 2" | 8" " | 3.00 ea. | 96.00 | 2.25 ea. | 72.00 |
| 69 | 1½" | 8" " | 3.00 ea. | 207.00 | 2.25 ea. | 155.25 |
| 41 | 1" | 8" " | 2.50 ea. | 102.50 | 1.87 ea. | 76.67 |
| 290 | ¾" | 8" " | 2.00 ea. | 580.00 | 1.50 ea. | 435.00 |
| 22 | 2" | 12" brick | 1.00 ea. | 22.00 | .80 ea. | 17.60 |
| 18 | 1½" | 12" " | .92 ea. | 16.56 | .80 ea. | 14.40 |
| 10 | 1" | 12" " | .84 ea. | 8.40 | .67 ea. | 6.70 |
| 160 | ¾" | 12" " | .76 ea. | 121.60 | .61 ea. | 97.60 |
| | | | Totals..... | 1,652.06 | | 1,247.68 |

WHEN YOU THINK OF *Lighting* THINK OF WESTINGHOUSE

*RLM Standard Dome*

*RLM Standard Deep Bowl*

*RLM Standard Symmetrical Angle*

*RLM Standard Silvered Bowl Diffuser*

*Shallow Dome*

*Glassteel Diffuser*

# Install the Locklite Line for *Complete* INTERCHANGEABILITY

"LOCKLITE" is an ingenious and exclusive electrical and mechanical connecting and disconnecting principle, which embodies an entirely new type of industrial reflector suspension and maintenance. This principle has been applied by Westinghouse to all of the industrial lighting reflectors shown in the panel at the left. Now complete interchangeability of reflector types and sizes is possible.

**Simple to install. Easy to maintain. Safer. More efficient . . . and completely interchangeable! All of these advantages are provided in "the Locklite Line" of Industrial Lighting Reflectors.**

At the time of installation, only the hood, from which the reflector is detachable, requires handling. The receptacle inside the hood does not have to be removed for wiring.

"Thirty second maintenance" is a fact. The maintenance man removes the dirty reflector with one hand and replaces it with a clean reflector including lamp with the other. No switching off and on of the current and only one trip up the ladder.

Safer, because every Locklite unit "lights when it's locked." More efficient, obviously!

**COMPLETE INTERCHANGEABILITY** however, is a decisive factor in many an industrial installation. One hood fits all reflectors, both of the medium and mogul type, making all Locklite Units interchangeable. Convenient, practical and economical.

Don't take our word for it. Ask to see Locklite at your own desk. Your nearest Westinghouse Jobber will be glad to oblige. Or write for descriptive folder with full details to Westinghouse Electric & Manufacturing Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

*Westinghouse is a member of*

RLM STANDARDS INSTITUTE

*Locklite reflectors may be connected or disconnected by a simple "twist of the wrist."*

**Westinghouse Lighting Equipment**

# Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

## Color on Machines

**Q.** *"We furnish our customers machines fully wired. This includes the motor (not exceeding 3 hp. on services ranging from 110 to 550 volts), switch and wires connecting same. We make the complete assembly at our factory. We have adopted as standard, a three conductor lead-covered cable including one red, one black, and one white wire enclosed in flexible conduit. The machine is grounded by means of a grounding lug fastened to some other part of the machine frame.*

*An objection to the cable has been raised because of the use of white for the third conductor. Section No. 103002, Paragraph f, of the Code has been set forth as the basis for this objection. It is claimed that we are using white for other than a ground wire and in violation of this Section.*

*Section No. 103002, Paragraph f, deals with two situations: first, identified conductors where a white wire is required, and secondly, unidentified conductors where no white wire is allowed. Our machines are completely wired units, and, therefore, it is our contention that it makes no difference what color these wires are."*—Motor Driven Machinery Manufacturer.

**A.** The objection to the use of a white wire for an ungrounded circuit conductor is proper as the Code definitely prohibits the use of a white wire for other than an identified conductor. This is found in Section 2006 which reads, "Conductors having white or natural-gray covering shall not be used other than as conductors for which identification is required by this section . . . " This rule has been correllated with the third sentence of paragraph f of section 103002.

The fact that the whole machine is wired complete at the factory has no bearing on the case, as each machine has to be inspected in detail by the inspector wherever it may be installed. The inspector would have no knowledge as to how the machine might be wired without making an inspection of it and, as he has to certify as to the correctness of the wiring, he must make the detailed examination. And in order that the installing contractor would not be confused the inspector would require compliance with the Code.

The only way to avoid this local inspection of the machine would be to have it inspected and labelled by Underwriters' Laboratories.

## Outlets per Circuit

**Q.** *"In cases where the lighting load per circuit is not known in single family dwellings, what number of outlets per circuit would be advisable?"*—G. C. P.

*ILLINOIS INSPECTORS—have chosen Elton A. Gould of the Gould Electric Company of Chicago (right) as the contractor member of the Chapter Executive Committee. Secretary W. J. Alcock (left) leans over for a word of congratulation.*

**A.** As required by section 2108 the number of circuits should be computed in accordance with section 2107a by using the area of the dwelling in square feet and multiplying by 2 watts per square feet and adding 1500 watts for appliances. Then by dividing this result by 1650 watt (the allowable capacity of each 15 amp. circuit) the quotient is the number of circuits to be used.

When this number of circuits is installed, any number of outlets may be placed on a circuit. If this method is not employed then 2108b should be used and as each outlet is to be assumed as having a $1\frac{1}{2}$ ampere load the number of outlets on a 15 ampere circuit should not exceed 10. $(10 \times 1\frac{1}{2} = 15)$.

## Lightning By-Products

**Q.** *"I am having a conference with a customer regarding 'fireworks' in his house during a severe thunderstorm, and wish to be sure of my statements. The house is in process of remodeling and lightning rods are hanging off building, though still grounded as originally. Possibly not too well as site of house most likely is a ledge of rocks.*

*A steam heating plant has been added since lightning rods were installed and rods are not bonded to it.*

*A conductor (lightning rod) runs along the ridge of the house and a BX cable runs along the same ridge beam thus being separated from rod by some 10 inches of wood and not bonded to rod anywhere.*

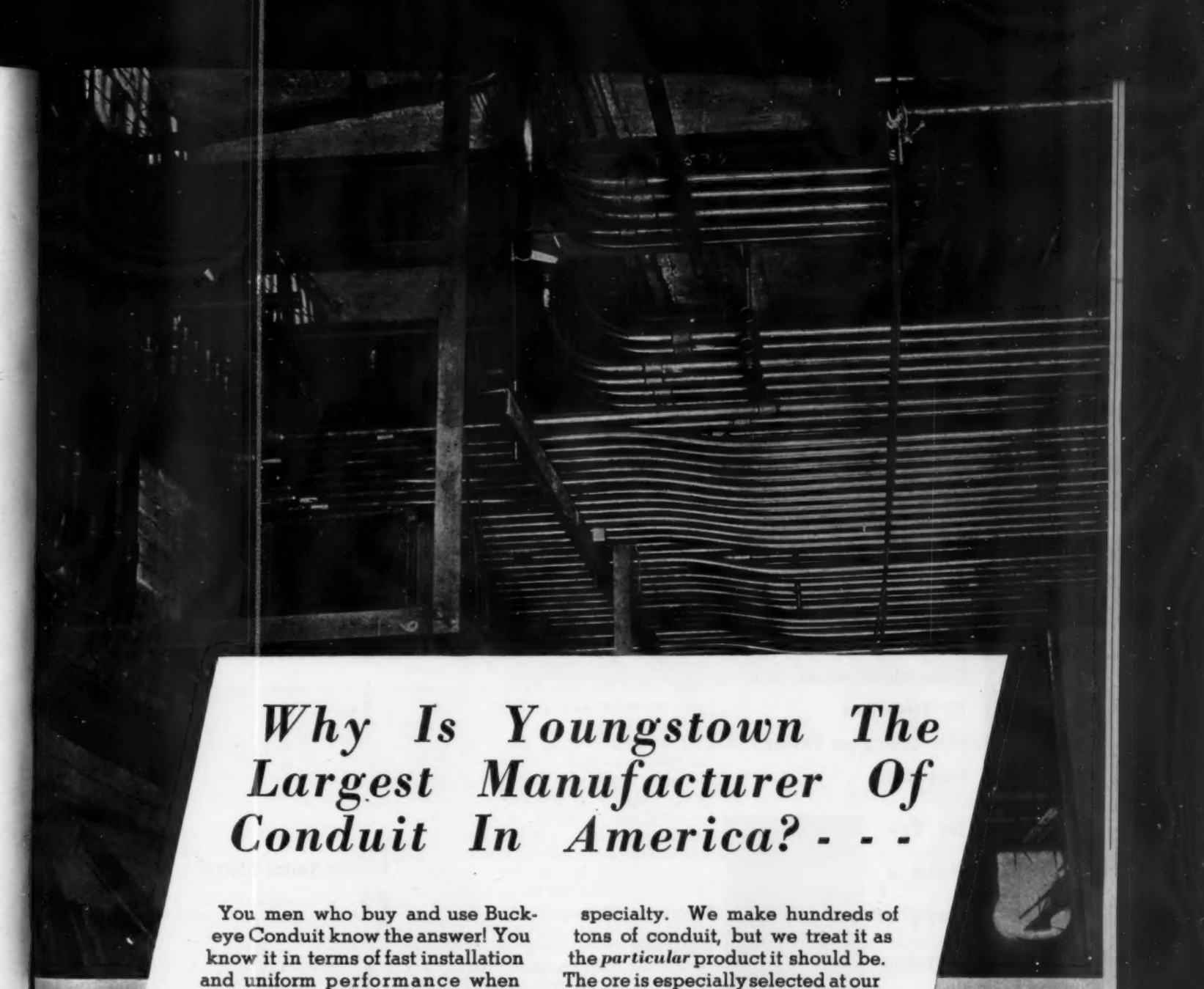
*Also one of the carpenters complains of the same 'fireworks' in his house, whenever there is a storm."*—H. I. L.

**A.** The N.F.P.A. "Code for Protection Against Lightning" gives the following information.

"If a lightning conductor system is placed on a building within or about which are metal objects of considerable size within a few feet of the conductor, there will be a strong tendency for sparks, or side flashes, to jump from the conductor to the metal at its nearest point. To prevent damage an interconnecting conductor should be provided at all places where side flashes are likely to occur."

"Within buildings where metallic objects may be liable to a dangerous rise of potential due to a lightning flash, the metal, if not connected with the lightning rod system, should be independently grounded and in some cases both interconnected and grounded."

Section 216C of the same Code requires that "Metal situated wholly in the interior of buildings which at any



# *Why Is Youngstown The Largest Manufacturer Of Conduit In America? - - -*

You men who buy and use Buckeye Conduit know the answer! You know it in terms of fast installation and uniform performance when working a series of bends with the hickey. You know what no back lash means to a man trying hard for a neat job. You know what time and money are saved when threads come clean on the first cut and need no chasing. But do you know why Youngstown Conduit does all these things?

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Ask your distributor for Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes

26-9B

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

# YOUNGSTOWN

## Questions on the Code

[FROM PAGE 56]

point comes within 6 feet of a lightning conductor shall be electrically interconnected with it and if of considerable size or length shall be grounded at its lower or farther extremity within the building."

A note to the above ruling explains that " . . . . In general, experience has shown that side flashes are not likely to occur to bodies of ordinary size located more than 6 feet from a conductor, whereas those that are nearer are likely to receive side flashes which may damage a building or set fire to it."

From the above it can be realized that the difficulty experienced by our correspondent is caused by induced charges, or side flashes, because the interior wiring cable is too close to the lightning rod. The proper remedy, therefore, would be to reroute the armored cable so that it will be more than 6 feet from the lightning rod and also to make sure that the armor is well grounded.

The Code contains these words of caution regarding interconnection of interior metal with lightning conductors: "Very long or very large bodies of metal may, however, be a menace at more than 6 feet. The side flashing to these nearby bodies is eliminated by interconnection but the *rise of potential due to dynamic discharge is not,* so interior grounding becomes necessary. Unless there are waterpipes or their equivalent which may be used for grounding purposes there may be danger to persons or livestock about dwelling houses or barns." For this reason it is better to avoid the necessity for interconnecting by keeping the cables well over 6 feet away from any part of the lightning rod equipment.

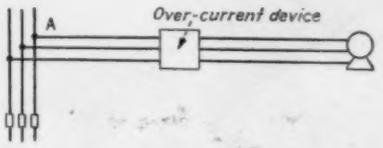
### Receptacles in Bathroom

**Q.** *"What does the Code rule on convenience outlet plugs and their location in bathrooms?"*—N. K. McA.

**A.** The Code does not have much to say relative to the location or position of attachment receptacles, except that it specifies in section 4173 that receptacles located in floors are to be enclosed in floor boxes approved for the purpose, and in section 4105 that "receptacles shall not be installed within reach of bath tubs and shower baths." The distance above the floor for receptacles is not a Code specification.

### Treat as Branch Circuit

**Q.** *"Abbott's book claims that when more than one motor is supplied by a branch circuit as shown below, the wires from the overcurrent device to the motor are considered the branch circuit and the size could be according to rule 4312, which is 125% the motor full load current.*



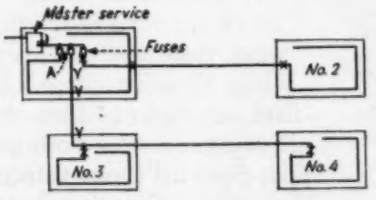

*In my opinion these wires are the branch circuit because Article 100 states 'the branch circuit conductors are the wires from the final overcurrent device to whatever it supplies.' Therefore it seems that the size wire from the overcurrent device to the motor should be the same size as those from the motor branch circuit to the overcurrent device. What is your opinion?"*—F. B.

**A.** The answer to this is found in the last sentence of 4343b and also in 4349. If the tap from point A to the overcurrent device is not less than ⅓ the capacity of the feed, to which it is connected, and is not over 25 feet long, the scheme is correct.

### Building Switch Control

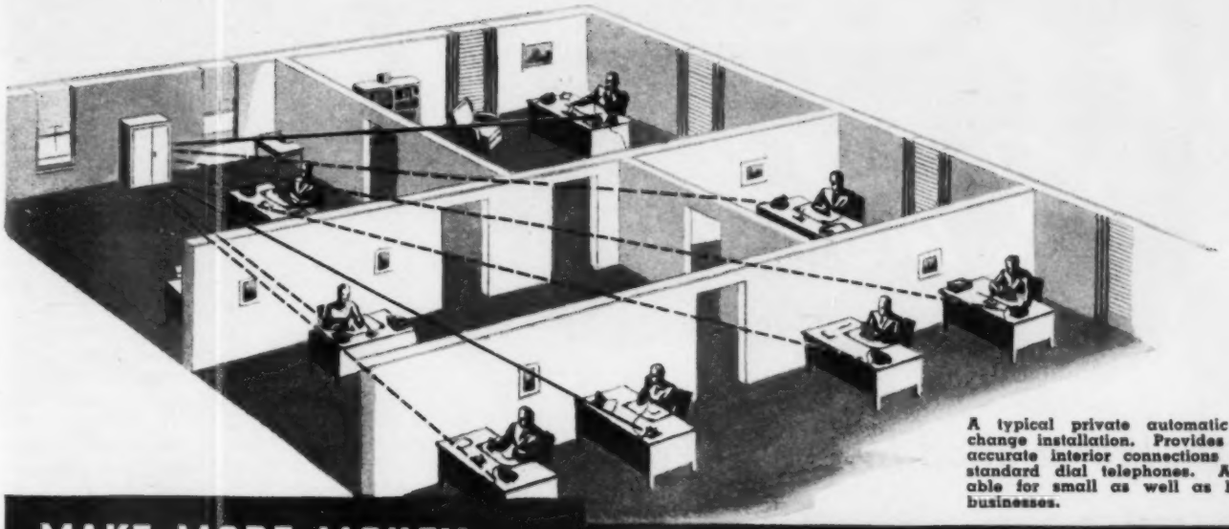
**Q.** *"I would appreciate your interpretation of Article 230, Section 2306, with a diagram."*—L. T.

**A.** The service enters building No. 1 at the master service (switch and fuse). If there is a switch at A to control buildings No. 2, No. 3 and No. 4,




switches will not be required at X, Y or Z. If there is no switch at A, building No. 2 may be controlled by a switch located at any point X (and only one required). Buildings No. 3 and No. 4 may be controlled by one switch at Y or by two switches at Z.

If a switch at point A is used, it must be accessible to users of buildings No. 2, No. 3 and No. 4. The point X selected must be accessible to user of building No. 2. The point Y selected must be accessible to users of building No. 3 and No. 4.



A typical private automatic exchange installation. Provides fast, accurate interior connections with standard dial telephones. Available for small as well as large businesses.

# MAKE MORE MONEY — *Recommend* PRIVATE INTERIOR TELEPHONE SYSTEMS

**INTERCOMS** (upper left) Common-talking, selective-ringing systems in capacities of two to eleven stations. Beautifully designed, and durably constructed for long, faithful service. Operate from dry cells or battery eliminators.

**SERV-U-FONES** Attractively priced common-talking systems in capacities of two to ten stations. Conveniently packaged, simple to install. Dry cell operated.

**AUTO-COMS** (upper right) Deluxe itercom. systems providing selective talking and selective signaling service for a maximum of ten stations, and up to five connections at one time. No automatic switchboard needed.

**P-A-X'S** private Automatic Exchange systems, available in all capacities. Use standard automatic telephones and provide for a variety of special communication services.

## . . . for offices . . . shops factories . . . homes

**The need of business for fast interior communication provides many opportunities for you to recommend private telephone equipment. Go after this business. Sell Automatic Electric Private Interior Telephone Systems every chance you get. You will profit and so will your customers.**

**Automatic Electric has been making telephone equipment for over 40 years—making equipment to satisfy every requirement. Shown here are four of the many types of private systems available. Our field representative will be glad to supply you with literature, prices and discounts as well as to work with you on particular jobs.**

AUTOMATIC AE SD ELECTRIC

## PRIVATE INTERIOR TELEPHONE SYSTEMS

**Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois**

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# In the News

## Motor Shop Men Plan Progress

### NISA Convention in St. Louis Reviews Shop Experience and Looks Ahead—Pilmer the new President

Motor shop men advanced their program for cooperative progress at their sixth annual convention in St. Louis, April 17-19. Representatives of 200 leading motor repair shops of the country, members of the National Industrial Service Association, gathered at the Hotel Jefferson with John C. Launder, of Kansas City, in the chair.

The most important action taken was a change in the program for motorshop certification, which has been under discussion for two years. The plan previously proposed was to organize a small group within the membership, who were ready to pay an additional subscription to join in an immediate certification system. It was decided to recast the plan to include all members. The objective remains essentially the same, to study methods in use in motorshops throughout the country and to encourage the adoption of more efficient shop practices and business policies, to the end that the service of these shops secure enhanced prestige in the market.

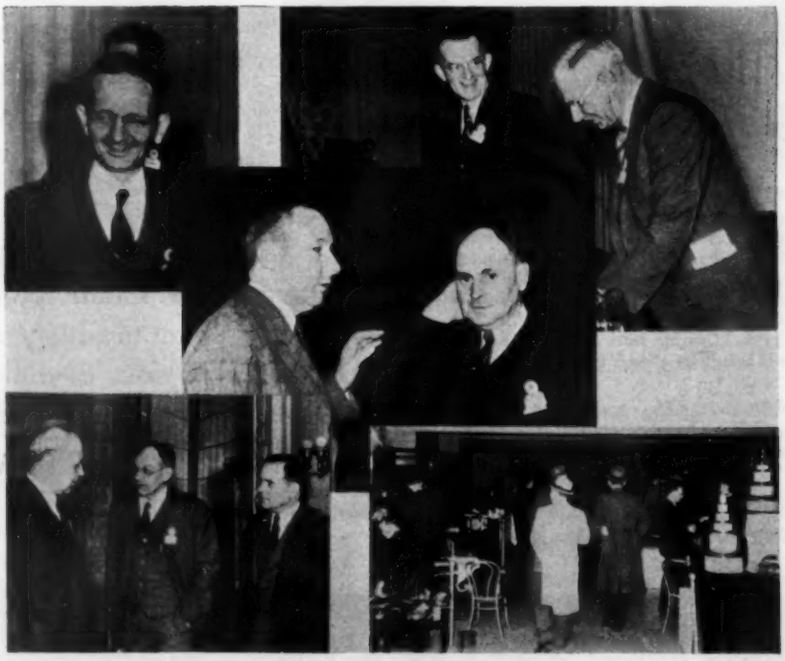
The convention program provided an embracive review of present day problems of the repairmen. It combined broad topics like the application of the Wages and Hours Act, discussed by C. S. Cullenbine of St. Louis; insurance coverage by W. H. Semsrott, St. Louis; legislation affecting business by Linus Lilly, St. Louis; cooperation with power companies by C. H. Kraft, St. Louis; trade relations by W. J. Wheeler, New York; salesmanship by H. T. Bussman, Bussman Mfg. Co., St. Louis, and the study of overhead cost and hidden expenses by Leonce Bonnecaze, of New Orleans, and S. F. High of Cincinnati.

Technical discussions followed including trends in motor design by C. P. Potter of Wagner Electric Mfg. Co.; opportunities for motor control sales by A. H. Fensholt of Allen Bradley Co.; glass insulation by R. L. Yaeger of Owens-Corning Corporation; studies of shop operation costs by P. G. Winter of Indianapolis; unit and job costs by G. P. Svendsen of Minneapolis and service shop character by F. E. Briner of St. Louis.

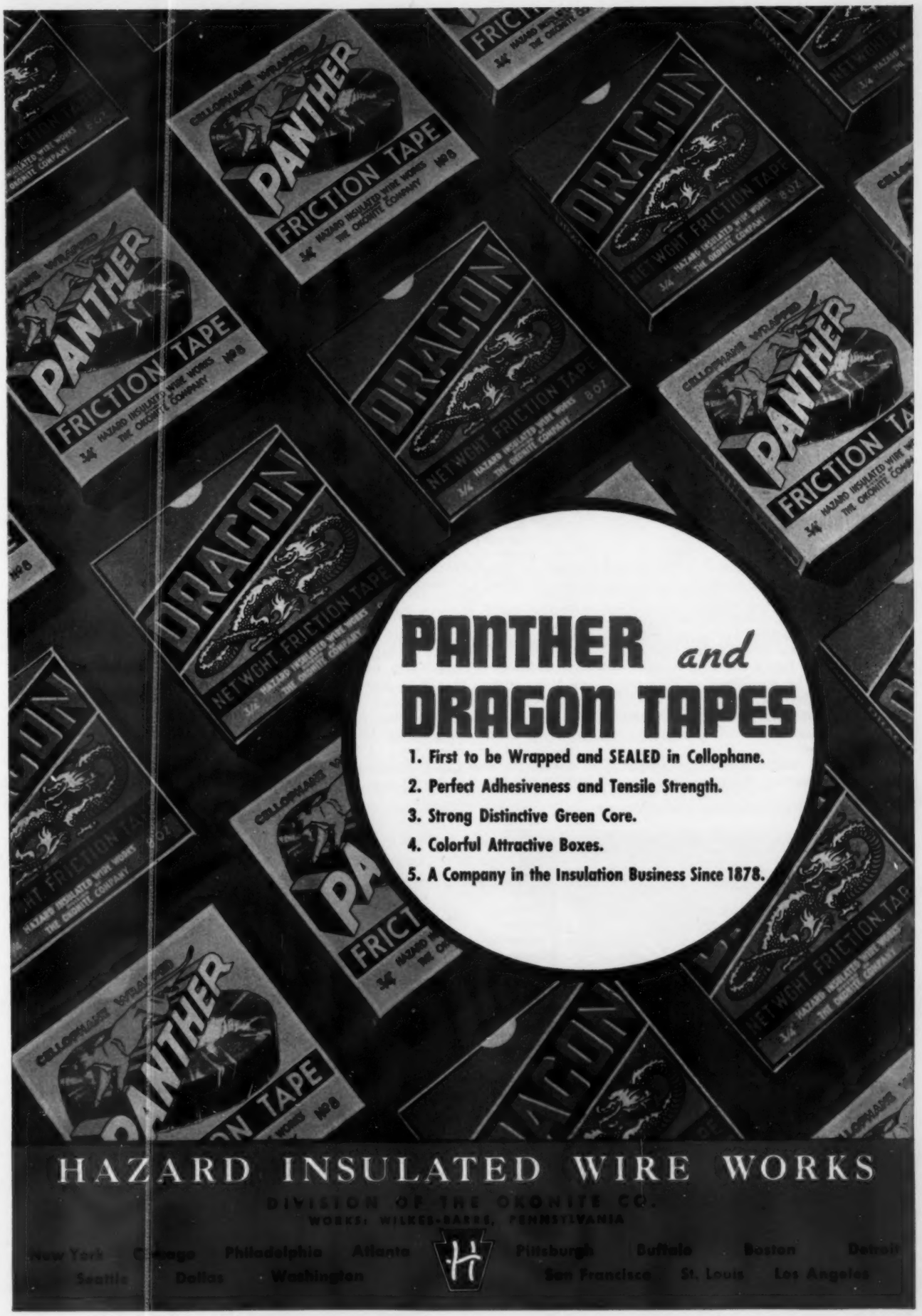
A successful innovation in the program was an afternoon symposium by motorshop men. T. A. Converse of Troy and F. W. Willey of Cincinnati talked on stripping methods. R. A. Shearer of Indianapolis, G. P. Svendsen of Minneapolis, H. J. Steeb of New York, C. C. French of St. Louis and F. W. Willey discussed cleaning. G. F. Stratton of Charlotte, F. W. Willy and A. J. Kaiser of Hollis, N. Y., presented winding experience. A. F. Anderson of Nashville talked on baking. Wm. Braunlich of Pittsburgh and G. G. Johnson of Staunton discussed methods of balancing. G. G. Johnson also covered soldering practice. And the subject of shop layout and servicing for small motors was expounded by F. M. Mielke of Duluth, A. L. Brown of Worcester, H. E. Grant of Nashville, C. W. Nunn of Evansville, and J. W. Becker of Ideal Commutator Dresser Co. These papers were supported by many slides illustrating shop methods.

The following officers were elected to serve through the coming year—president, J. M. Pilmer, Electric Engineering & Construction Co., Des Moines, Iowa; vice-president, Carl A. Sievert, Sievert Electric Co., Chicago; secretary, Leonce Bonnecaze, Best Electric Co., New Orleans, La.; treasurer, Alfred L. Brown, Alfred L. Brown Associates, Worcester; directors, Charles French, St. Louis, S. V. Steffner, Chattanooga, H. R. Dillon, Alliance, G. G. Johnson, Staunton.

A successful entertainment program was organized by a local committee headed by Charles French. It included a banquet, a joint luncheon with the St. Louis Electrical Board of Trade, a performance of "The Convict's Daughter" on an old time Mississippi River Showboat and other enjoyments. An exhibition of manufactured products was participated in by the Frank Adam Electric, Allen-Bradley, Anaconda Wire & Cable, Bussman Mfg., Century Electric, Cutler Hammer, John C. Dolph, Emerson Electric, Essex Wire, Ideal Commutator Dresser, Insulation Inc., Owens-Corning, Potter & Rayfield, Superior Insulating, Wagner Electric, White Supply and Wm. Wurdock Electric companies.



*AT THE NISA MEETING—Frank W. Willey, Cincinnati, discusses certification (top left); President John E. Launder, Kansas City, and Treasurer A. L. Brown, Worcester, at the speakers table (top right); W. J. Wheeler, New York, 1938 president, leaning on J. M. Pilmer, Des Moines, president for 1940 (center); local convention chairman Charles French, St. Louis, NISA Executive Secretary Stewart Clarkson and Carl Christine, manager of St. Louis Electrical Board of Trade, who made the party a success (bottom left); and a squint at the exhibits of motor and control equipment.*


PANTHER and
DRAGON TAPES
1. First to be Wrapped and SEALED in Cellophane.
2. Perfect Adhesiveness and Tensile Strength.
3. Strong Distinctive Green Core.
4. Colorful Attractive Boxes.
5. A Company in the Insulation Business Since 1878.
HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE CO.
WORKS: WILKES-BARRE, PENNSYLVANIA
New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit
Seattle Dallas Washington San Francisco St. Louis Los Angeles

## In the News

[FROM PAGE 60]

### BIG FALL PROGRAM FOR BETTER LIGHT

Intensified activities in support of improved lighting are announced by the National Better Light-Better Sight Bureau. With the month of October designated as National Better Light-Better Sight Month, a close tie-in is provided with the optical industry's Better Vision Institute, which will observe the last week in September as Better Vision Week. This marks the first such nation-wide undertaking by the optical industry, and it will stress the importance of eye protection and focus public attention on care of the eyes.

Many local groups are planning to stage Better Light-Better Sight Shows or exhibits this fall. Advertising materials and ideas will be available through the Bureau.


*FLORIDA CAMPAIGNERS—Here we see Florida's "Road Show of Adequate Wiring" and the men who put it on so effectively during a recent tour to various cities in that state. These Knights of A/W are: F. J. McGinniss (center) of Palm Beach, secretary of the state association; W. H. Davidson (left) and A. C. Bergh (right) of the Florida Power and Light Company. To cap their efforts, this trio appeared before the recent Orlando meeting of the Florida Association of Electrical Contractors and Dealers, when this photo was taken.*

### CALIFORNIA CONTRACTORS MEET

Electrical contractors of California held their first statewide convention since 1929 in Fresno, April 22. The purpose was to discuss a new ruling relative to application of California's state sales tax to construction. Beginning July 1 electrical construction ceases to be considered as a retail sale and the sales tax applies only on the cost of the materials. Difficulty in interpreting this phase of the problem has caused confusion.

Laurence W. Davis, manager, National Electrical Contractors Assn., made a special trip to the Coast to address the meeting. Clyde L. Chamblin presided at a session on labor relations. Bid depository methods, association procedure, and similar matters occupied the remainder of the time. K. M. Ryals, Stone-Ryals Electric Co., San Francisco, presided on behalf of the Electrical Contractors Assn. of Northern California, and Clare Smallcomb on behalf of the Los Angeles Chapter.

"My husband was all the time complaining he couldn't find the key-hole!"

### TWENTY THREE A/W GROUPS NOW OPERATING

The latest addition to the National Adequate Wiring Bureau's list of certification groups is the Electric Institute of Kentucky, Inc., the twenty third local organization to tie in. The Institute received its license to operate in the City of Lexington, and in seven counties adjacent thereto. Current promotional activities of the National Adequate Wiring Program, as reported from other areas include:

*Indianapolis, Ind.*—An Electric Home Complete, displayed under the sponsorship of the Electric League of Indianapolis and the Adequate Wiring Committee, attracted several thousand visitors.

*Atlanta, Ga.*—A series of home service meetings conducted by the Georgia Power Co. presented the complete story of the National Adequate Wiring Program, using the National Bureau's new Visualizer. A similar presentation is planned at contractor meetings throughout the State.

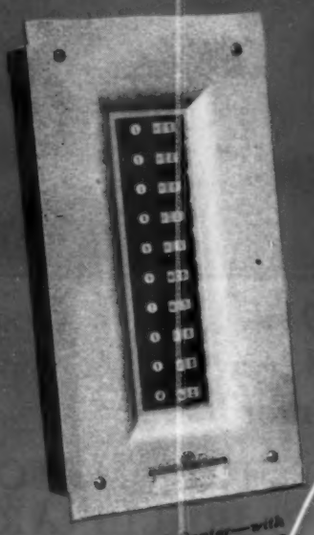
*Roanoke, Va.*—More than 10,000 visited the model adequately wired home at the recent Electric Show. This home demonstrated wiring by means of cutaways.

*Dallas, Tex.*—Six homes were certified by the end of March and 65 plans checked.

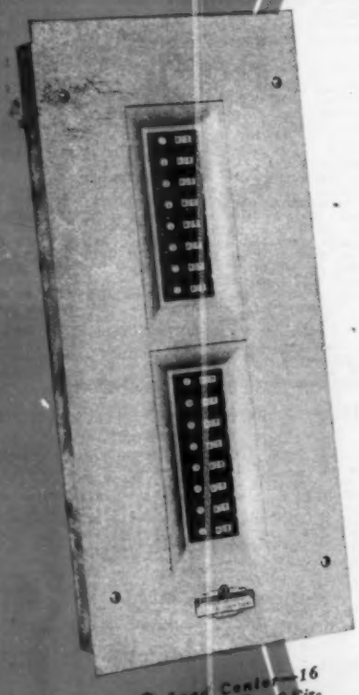
*Staten Island, N. Y.*—The Staten Island Edison Co. is launching a program to help organize the industry to sell adequate wiring and to publicize the subject generally.

*Akron, Ohio*—Three co-operative local builders are now incorporating adequate wiring in their new homes as a regular feature.

*Youngstown, Ohio*—The Electric League of Youngstown will provide flood-lighting



Ⓕ Load Center—with 10 Single Pole Ⓕ AC Circuit Breaker Branch Circuits



Ⓕ Load Center—16 Single Pole Ⓕ AC Circuit Breaker Branch Circuits

EST. 1894 — THE SIGN OF A BETTER JOB

Frank Adam

# LOAD CENTERS

## AC CIRCUIT BREAKER TYPE

FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

**FLEXIBLE! Easy to Change Branch Circuit Capacities, when required . . . Circuit Breakers can be Interchanged by Removing Only 2 Screws**

In small installations such as Residences, Stores and Filling Stations, Ⓕ AC Circuit Breaker Type Load Centers are often used where a high-quality job is desired—either in conjunction with Ⓕ AC Circuit Breaker Type Service Equipment or as individual units.

The Ⓕ AC Circuit Breakers used in these Load Centers are of the thermal type—trip free and non-closeable on overloads and short circuits. They incorporate these 4 distinct advantages:

(1) Provide automatic, positive protection against short circuits and sustained overloads.

(2) Prevent needless circuit interruptions when momentary overloads occur, because they are designed with the proper time lag characteristics.

(3) Easy to restore service after the circuit is cleared — operating handle can be manually turned to "ON" or "OFF" position, like an ordinary tumbler switch.

(4) Flexibility . . . Easy to change branch circuit capacities, when required. Circuit Breakers can be interchanged by removing only two screws.

For 120 volt AC service . . . Capacities: 15, 20, 25, 35 and 50 amperes . . . Approved by Underwriters' Laboratories . . . Standardize on Ⓕ Products . . . Write for full details contained in Bulletin No. 58.

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

FA TRADE MARK PRODUCTS .. "The Sign of a Better Job"

## In the News

[FROM PAGE 62]

for the first ten building contractors who exhibit homes wired in accordance with the local standards.

*Houston, Tex.*—The Houston Lighting and Power Co., plans to furnish architects, builders and contractors with sample drawings of various types of homes, including wiring specifications.

### PENNSYLVANIA CONTRACTORS SEEK LEGISLATION

Following recent sectional meetings, contractors and workers from various parts of Pennsylvania met in Harrisburg to discuss ways and means for securing proposed electrical legislation. Albert O. Emig of Lewisburg, president of the Keystone Electrical Contractors Association pointed out that there are only a few localities in the state, which require electrical contractors and workers to be licensed. Even these regulations, he said, are very inadequate as a whole to meet the necessary requirements for an experienced electrical worker.

These associations were represented at the capital: Pittsburgh Contractors Association, Lancaster County Contractors Assn., Philadelphia Constructors, Independent Philadelphia Contractors Assn., Erie Contractors Assn., Harrisburg Contractors Assn. Also delegates from—Milton, Shamokin, Mt. Carmel and Williamsport.

### CANADIAN CONTRACTORS ARE TELLING THEM

Educational information on the need for adequate wiring, the value of first class supplies and workmanship, and the uneconomical features of cut-price installations, are emphasized in the advertising recently launched by the Vancouver Electrical Association in the B.C. Journal of Commerce & Building Record. The names of all contractor members of the Association appear in the advertising, copy for which is changed regularly.

These ads appear in the monthly electrical section of this paper, which reaches all architects in western Canada, building contractors, those taking out building permits, municipal officials, commercial and industrial executives, shipping and transportation companies and municipal, civil and mining engineers.

### VANCOUVER SETS 1939 OBJECTIVES

A 1939 objective of $3,390,000 in new business was set for the electrical industry in Vancouver at a recent all-industry

banquet. Pointing out that this goal could be met through the industry's unity, W. C. Mainwaring told contractors, wholesalers, manufacturers and utility men that the contractor was most important. Inadequate wiring was retarding sales, while better wiring opened new markets for better lighting and the free use of new appliances. A breakdown of Vancouver's business possibilities was presented to the 450 members attending this banquet, which read:

| | |
|---|---|
| Appliance sales | $2,400,000.00 |
| Installation of appliances sold | 110,000.00 |
| 2,000 new homes—electrical work | 180,000.00 |
| 2,000 new homes—electrical fixtures | 120,000.00 |
| New and improved lighting of all types in existing buildings—fixtures and wiring | 190,000.00 |
| Industrial power and heating—expenditure for motors, apparatus and wiring | 250,000.00 |
| Commercial power and heating—expenditure for apparatus and wiring | 50,000.00 |
| Rural Territories 1.200 new customers—Line extensions and interior wiring | 90,000.00 |
| | $3,390,000.00 |

## MORRISON HEADS PHILADELPHIA LEAGUE

John A. Morrison was appointed managing director of The Electrical Association of Philadelphia effective on April 1st. He succeeded George R. Conover, who resigned after holding this position for ten years, to become manager of the public relations department of the Philadelphia Electric Company.

Mr. Morrison was promoted from the position of manager of the association's

*JOHN A. MORRISON managing director of The Electrical Association of Philadelphia*

Merchandising Bureau. Prior to his work in the Philadelphia League, he had gained a wide experience as a dealer, manufacturers representative and appliance sales manager for a New England electrical wholesaler.

## In the News

[FROM PAGE 65]

### NEW FIELD MAN FOR NORTH CAROLINA

The North Carolina Association of Electrical Contractors has employed Leon Kite of Charlotte as an additional field representative. Mr. Kite will assist C. S. Boger in state-wide affairs of the contractors. At the present time he has been busy getting acquainted with the membership and getting a line on pressing problems.

### DELMARVA GROUP ELECTS NEW OFFICERS

Meeting in Easton, Md., on April 17, the Delmarva Electric Association conducted one of the most successful sessions on record. Eighty-three members and guests attended the afternoon and evening sessions. Guest speaker at the evening program was Samuel G. Hibben, Director of Applied Lighting, Westinghouse Lamp Co. Displays of new equipment were presented by five manufacturers.

Officers elected for the ensuing year are: K. J. Miller, Salisbury, Md., president; C. D. Forney, Easton, Md., vice president; A. R. Bailey, Hebron, Md., treasurer; J. Russell Hopkins, Salisbury, Md., secretary; and E. R. Kingery, Dover, Del., J. E. Wheatley, Cambridge, Md., A. B. Collison, Milford, Del., J. E. B. Kilbourne, Baltimore, Md., and W. P. Dashiell, Salisbury, Md., directors.

### COMING MEETINGS

**Ohio State University**—Eighth Annual Welding Engineering Conference. Industrial Engineering Building, Ohio State University Campus, May 11 and 12.

**National Electrical Manufacturers Association**—Spring Conference, The Homestead, Hot Springs, Va., May 14–18.

**National Electrical Wholesalers Association**—Annual Convention, The Homestead, Hot Springs, Va., May 22–25.

**National Electrical Credit Assn.**—Annual Convention, Hotel Philadelphian, Philadelphia, Pa., May 18–19.

**Ontario Electrical Contractors Association**—Hamilton, Ont., June 1.

**New York State Assn. of Electrical Contractors and Dealers**—Annual Convention, Higby's, Big Moose, N. Y., June 20–23.

**Illuminating Engineering Society**—Annual Convention, San Francisco, Calif., August 21–25.

**International Association of Electrical Inspectors**—Western Section, Hamilton, Ont. Sept. 11–15; Southern Section, Asheville, N. C., Sept. 18–22; Eastern Section, Providence, R. I., Oct. 2–6.

**National Electrical Contractors Association**—Annual Convention, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 9–12.

**National Electrical Manufacturers Association**—Annual Conference, Palmer House, Chicago, Oct. 23–27.

# H & H *New Twist-Tite*


# DUPLEX RECEPTACLES

Takes any standard parallel-blade Cap and holds it from pulling out *accidentally.* Insert the Cap, twist slightly to right, to lock it in the Receptacle. Insert the Cap *without* the twist, and it pulls out as easily as from any other receptacle.

*Twist-Tite's* grip on the Cap saves bothersome interruptions. Attachment cords stay put; portable lamps stay connected; vacuum cleaners and other appliances keep running until *purposely* stopped.

*Twist-Tite* has completely enclosed body of molded Bakelite or white Ivorylite, locked to anchored mounting straps. Takes standard Bakelite or Ivorylite Plates (new UNILINE design). Mere thumb-pressure on plate screw *sets up* the screw; makes firm fastening: — the new "Clix-in" Mounting.

| Cat. No. | List Price per C. | Description | Std. Pkg. | Carton |
|---|---|---|---|---|
| 9200 | $32.00 | Brown Bakelite | 100 | 10 |
| 9200-I | 39.00 | Ivorylite | 50 | 10 |

SOLD THROUGH YOUR ELECTRICAL WHOLESALER

**HART & HEGEMAN DIVISION**
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

## In the News

[FROM PAGE 66]

### CHECK NON-COMPETITIVE RURAL AWARDS

The practice of the Rural Electrification Administration giving its approval to construction contracts awarded by local borrowers without competitive bidding is leading into an investigation. Representative Albert J. Engel of Michigan who asked the Comptroller General for this action, stated that Michigan contractors have complained about several contracts awarded without competition in their state.

According to REA officials, the policy of direct negotiation of construction contracts is utilized only when lack of time or other circumstances make it inadvisable to incur the delay incident to formal advertising, opening bids, and awarding contracts. It is frequently forced by the threat of "spite" lines in the area. Last year, of $48,000,000 in awards, less than $4,000,000 worth were negotiated. The procedure is used only after careful consideration and a checking of bid against known construction costs for similar projects. The contracts, it is pointed out, are between local project sponsors and contractors, and are not subject to any legal requirements applicable to normal government lettings.

### PROPOSE IMPROVED THERMOSTAT CONTROL WIRING

Because inspectors have found such a miscellany of wiring materials used as thermostat control wires, some standardized safeguard has been proposed by wire manufacturers. Ordinary bell wire is probably the material most frequently found, though this type of wire is intended for use only with primary batteries or for bell-ringing transformers, limited to 25 volt service and to a maximum of 50 watt capacity. They are not recognized for 110 volt service or for use with power transformers which exceed 50 watts.

Complaints from inspectors prompted the wire manufacturers of NEMA to prepare standards for thermostat control cables, both with rubber and asbestos insulation. It is proposed that Underwriters' Laboratories establish a standard and an approval procedure for thermostat control cables, taking into consideration the standards which have been prepared. If it is done, inspectors will be able more effectively to safeguard these installations.

### MANUFACTURERS NEWS

**Ward Leonard Electric Co.** of Mount Vernon, N. Y., has opened a new office at 1600 Arch Street, Philadelphia. Frank Beede, formerly of the Chicago office, is district manager. William Miller Tompkins and Lester B. Free, former Ward Leonard representatives at Philadelphia also join the organization.

# *Not so difficult in New Homes*

but —

# *Selling* ADEQUATE WIRING in OLD HOMES is A BIG JOB!

## *Let the FUSTAT help you do it!*


*Adequate wiring means* — **more circuits installed**

The Fustat prevents permanent overloading of the circuit. Once the correct size has been installed it cannot be replaced with a larger size and bridging it in any way is virtually impossible. If additional circuits are needed the user cannot sidestep the issue at the sacrifice of safety.

*Adequate wiring means* — **more satisfactory operation of appliances**

The Fustat prevents low voltage conditions that so frequently cause dissatisfaction with toasters, percolators and other appliances — because the Fustat keeps users from loading circuit beyond the proper capacity of the copper.

*Adequate wiring means* — **more outlets per circuit**

The Fustat permits adding a maximum number of outlets to the circuit. Its long time-lag keeps it from blowing needlessly on motor-starting currents — yet it prevents the wiring from being loaded beyond the capacity of the Fustat. Hence, adding any number of extra outlets is a perfectly safe practice.

*Adequate wiring means* — **more appliances in use**

The Fustat permits adding more appliances to a circuit. It doesn't blow on motor-starting currents or other harmless overloads. The circuit can be loaded to approved capacity without needless blows — and without sacrifice of safety.

*Adequate wiring means* — **more consumer good will**

The Fustat helps sell the electrical way of doing things — for it generally permits users to add new appliances without being annoyed by needless blows . . . it assures proper operation of appliances because low-voltage cannot be caused by overloading . . . it reduces chances of users being frightened by shorted cords burning up, for the quick action of the Fustat on dangerous cord shorts — prevents spraying of metal, starting of fires, burning of users . . . it helps teach user that the protective device is a desirable safeguard instead of a nuisance . . . thus it assists the whole industry to build towards bigger business and better times.

***The Fustat helps bring Adequate Wiring more quickly — so it's just good business to sell, install and use Fustats***

### WHAT IS THE FUSTAT?

It is a fuse to which a thermal cutout is added.

It protects like a fuse against short-circuits — even high resistance shorts such as occur in flexible cords.

It protects against permanent overloads, even when as light as 25%.

Retails at 7½c

**Yet it will not blow on motor starting currents of washing machines or other appliances.**

It has a base that guards against anyone robbing the circuit of protection.

It fits Edison base fuseholders through the use of an inexpensive adapter.


# The FUSTAT

For Full information write to any of these firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

Retails at 7½c in 15 to 30 amp. sizes

## In the News

[FROM PAGE 68]

**Lincoln Electric Company** of Cleveland announces the opening of a new office in Duluth, Minn., at 222 South 21st Avenue, East. I. R. Bartter, formerly with the Minneapolis office, will be in charge of the new branch.

**Hunter Fan & Ventilating Co.** of Memphis, Tenn., announces the appointment of Arthur T. Schultz as sales representative for upstate New York, starting with Poughkeepsie and also covering the Erie section of Pennsylvania. Mr. Schultz headquarters are located at 2809 Leibel Place, Utica, N. Y.

**The Tork Clock Company, Inc.,** of Mount Vernon, N. Y., has appointed David R. Baker as manager.

**All-Steel-Equip Company** of Aurora, Ill., announces the appointment of Halsey Darrow as advertising manager.

**Allen-Bradley Company** has appointed the Missouri Valley Electric Co. of Kansas City, Mo., as wholesale distributor for Kansas and Western Missouri.

**The B-L Electric Manufacturing Company** of St. Louis, Mo., has appointed the Benwood Linze Company of St. Louis as its domestic and export sales agents. The Benwood Linze Company also has acquired the interests of the Brenkert Light Projection Company, manufacturers of rectifier equipment.

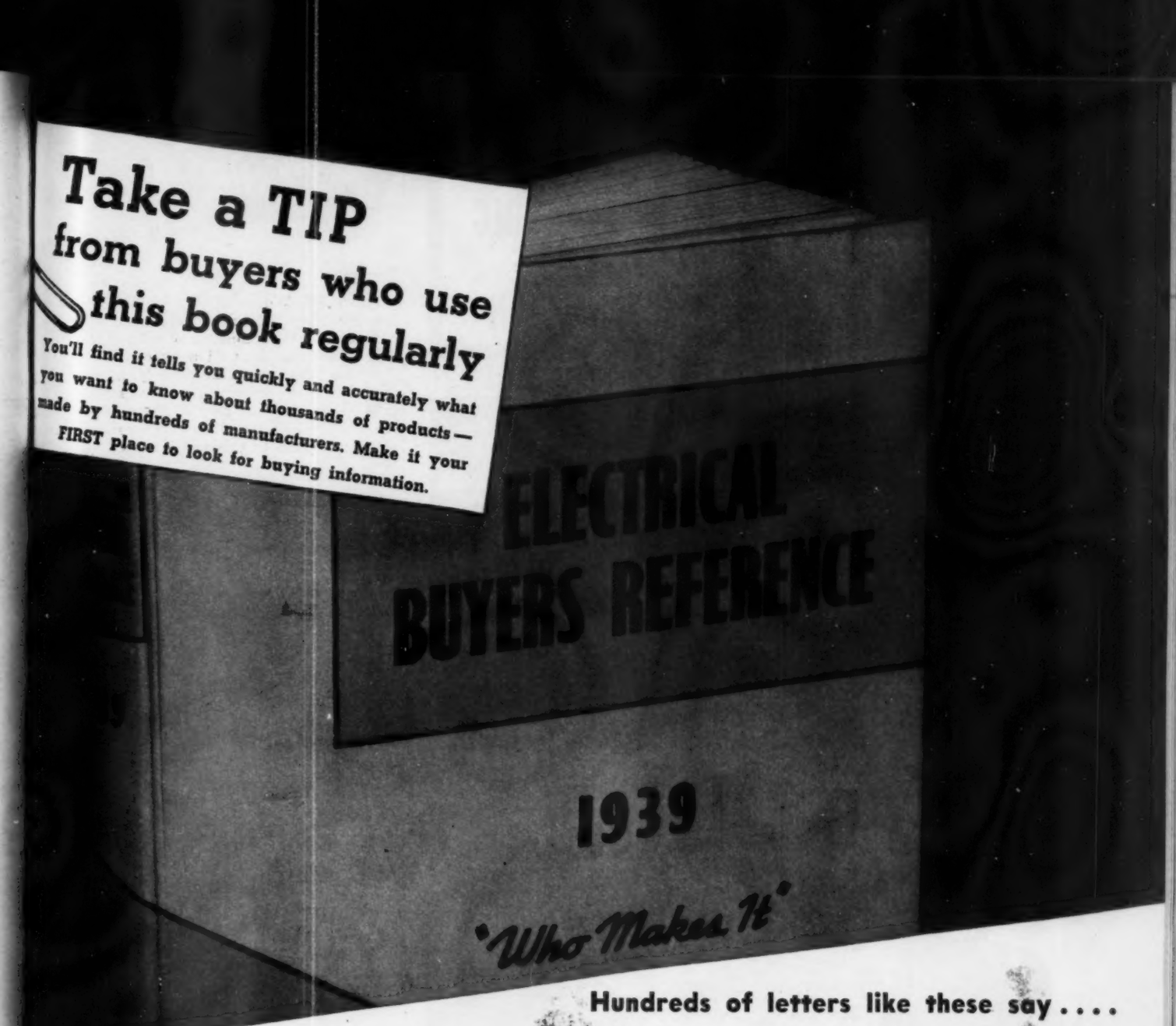
Dr. E. F. Lowry, formerly with Westinghouse Electric and Mfg. Co. and more recently with Continental Electric Company, has joined the **St. Charles Technical Laboratories, Inc.,** of St. Charles, Ill., to take charge of its hot cathode development.

**Paragon Electric Co.,** Chicago, announces the appointment of the following new sales representatives—

Herske and Timmis, Inc., 11 W. 42d St., New York, to cover metropolitan New York; northern New Jersey and eastern New York State.

C. T. Moore, 203 Mutual Bldg., Kansas City, Mo., to cover Western Missouri; Kansas and Oklahoma.

Conrad R. Bangh, 503 Sunderland Bldg., Omaha, Neb., to cover Nebraska; South Dakota and western Iowa.




**Hundreds of letters like these say....**

# "We Use It Regularly to Get Buying Information"

**Use It Every Day**—"I don't know how I could get along without this book. We have been receiving it for a number of years and use it about every day . . . has everything in it that is needed"—a radio and electric shop in Sabetha, Kansas, sent this message.

**Big Time Saver**—"We find this to be a very valuable book . . . there are many times when one has a product in mind and finds it impossible to think of the company that manufactures it. We feel that this book will be a big time saver to us," says a prominent contractor in West Frankfort, Illinois.

**Well Pleased**—"It is just the kind of a book I have been looking for! I am well pleased with it," writes a contractor in Elkins, West Virginia.

**Congratulations, Electrical Contracting**—"Electrical Contracting has my sincere thanks and congratulations for making possible this fine reference book," writes the head of a big outfit in Akron, Ohio.

**A Godsend to Small Fry**—"Should be a Godsend to every electrical contractor, especially the small fry, such as the writer, living in the small town. We are constantly beset with requests for information on materials and products that up to now we have been at a loss to trace," writes an electric company from Gallipolis, Ohio.

**Constantly Using**—"In the past we have very much appreciated this service and are constantly using the book . . . this copy is even better," writes an electric shop in Adrian, Michigan.

**Use Throughout Year**—"This publication is a handy book to have in our file and we have occasion to use it throughout the year," writes the Electrical Engineer of a large Refining Company in El Paso, Texas.

**Assists Materially**—"Anyone buying electrical supplies will find it assists them materially in locating supplies of various products. We will be glad to make use of it at every opportunity," writes the Purchasing Agent of an Elevator Manufacturer in Cincinnati, Ohio.

**Much Value**—"It will be of much value to us in locating sources of supply for material we need . . . the book in its present form is just what we need," writes the Maintenance Supt. of a Heating Element Manufacturer in Niagara Falls, New York.

## More Gossip

### No Squat—No Stoop

When Bob Wilson of the Sterns Electric Equipment Co., makes electrical layouts for Buffalo architects, he talks plug-with-switch outlets at all room entrances. And the idea meets with ready acceptance. On Bob's layouts there is no squatting and fumbling to plug in the vacuum cleaner. It's a sound selling suggestion for every home and apartment layout—offices too.

MAKES LIGHTING PAY—*In business for 25 years, A. B. Johnson of Orlando, Florida, has made fine residential and commercial lighting lead the way for the Johnson Electric Company. On top of a long record for high grade contracting work, the lighting business gradually grew into prominence. Separate display rooms are equipped for showing special fixture types or designs. One of these displays comprises fine crystal chandeliers exclusively.*

### Getting Them Out

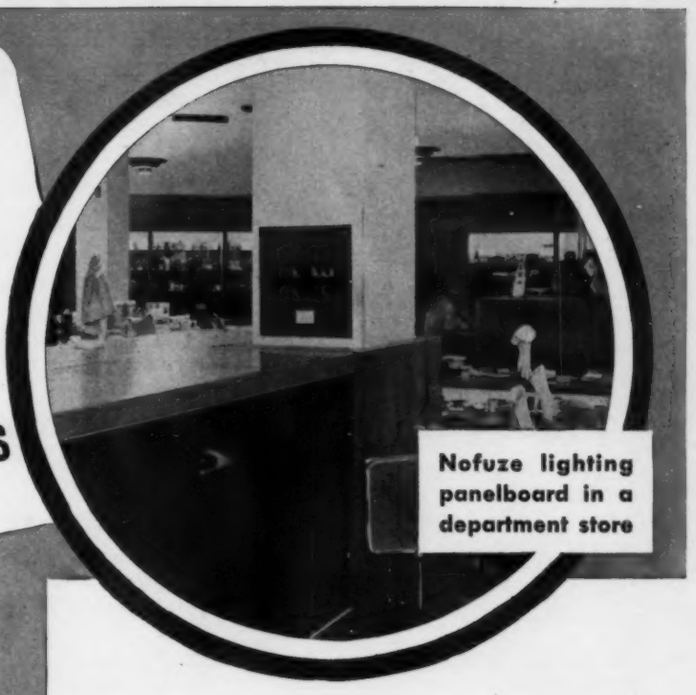
A novel plan that gets members out to night meetings is employed with good results by the Electrical Contractors Association of Utica, N. Y. Members fork up $1 at each current meeting to pay for their supper at the next meeting. Having paid in advance, they must attend or lose their supper money. The plan gets out a good number of this association's 40 members.

### Outage Protection

Garrett, Miller & Co. of Wilmington, Del., recently finished an unusual emergency generator installation for a large country estate. The owner wanted protection against interruptions to electric service that would allow normal use of electricity on a liberal scale. So a 25 kw. engine-driven standby generator outfit was installed, complete with automatic throw-over switch and starting batteries. With lights, motors and electrical cooking dependent upon continuous service, this owner went in for heavy-duty safety measures.

# *Growing!*

## A NEW PROFITABLE BUSINESS FOR ELECTRICAL CONTRACTORS



Nofuze lighting panelboard in a department store

Nofuze circuit protection in a chain of modern service stations

Nofuze Multi-Breakers in thousands of homes

## ARE YOU GETTING YOUR SHARE?

You can no longer be the first to make money with Westinghouse Nofuze equipment, but you can get on the band wagon today to get your share of this growing business.

Westinghouse Nofuze equipment protects circuits without fuses. It is safe, convenient and lasts as long as the wiring itself. There is nothing to replace. And it is approved by Underwriters' Laboratories.

Easy to install . . . costs little if any more than ordinary forms of circuit protection.

Stop at your nearest Westinghouse wholesaler's office, or see his representative for prices, sizes, and especially for the quickly installed units for Range and Water Heater Wiring. Investigate Nofuze equipment today.

J-60298-A

**Westinghouse Electric & Mfg. Company**
**East Pittsburgh, Pa.**

# Westinghouse Nofuze Protection

## More Gossip

### Eager to Learn

The Albany (N.Y.) Electrical Contractors Association, Inc. began a school for the electrical workers in its local union last fall. About 32 of 60 active wiremen registered. Evening meetings have since been held every week to hear lectures and discuss details concerning modern equipment, illumination, instruments and other electrical matters.

When a local newspaper gave publicity to this cooperative work, requests came in from parents who wanted to get their boys in the school. It indicates the popularity of our electrical trade. Maybe a school on electrical safety and adequacy would be equally popular to young and old.

*ROCHESTER MANAGER — The Rochester (N. Y.) Society of Electrical Contractors, Inc., has operated since February 1938 with Wm. Quinlan on the job as full time secretary. Mr. Quinlan came into this position well qualified because of his previous connections in the electrical wholesaling business and in electrical engineering work.*

### Florida Drama

While national attention was focussed on bringing paralysis-stricken Harvey Snite from China to Miami Beach, Florida, in an "iron lung," the Lyon Electric Company of that city was busy installing compressor motors, an emergency power system, and a special elevator at the Snite home.

### An X-Ray Job

The H. E. Crook Co. Inc. of Baltimore signed up an unusual job of high-voltage indoor wiring not long ago. It is for the U. S. Marine Hospital, and provides connections for seven X-Ray machines to be used in cancer treatment. There are five 220,000-volt and two 140,000-volt units to be installed. The wiring contract alone runs nearly $10,000.

# Keep UP-TO-DATE on new developments

*through this*

# FREE SERVICE

*Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation———*

**1.** Bulletin TNI-439a listing and illustrating special REA conduit fittings (weathertight) for rural electrification wiring. Appleton Electric Co.

**METAL-CLAD SWITCHGEAR**

**2.** Catalog 8-a consisting of 16 pages of data on metal-clad switchgear for indoor service. Illustrations, diagrams and dimension charts included. Roller-Smith Co.

**CAPACITORS**

**3.** Catalog No. 162A describing and listing in detail the entire line of capacitors for a.c. split-phase motor applications. Cornell-Dubilier Electric Corp.

**COOLING FAN**

**4.** Bulletin No. 115 describing and illustrating a portable window ventilator. Price list is also included. Viking Air Conditioning Corp.

**SWITCHES**

**5.** Catalog consisting of 130 pages featuring the Murray line of safety switches, fuse meter service and entrance switches, sealed fuse meter service switches, range switches, loadside switches, distribution devices, transformer metering and testing equipment, wiring accessories, fuse panels, socket type meter troughs and cabinets, box dimensions and knockout data. Metropolitan Device Corp.

**CONDUIT FITTINGS**

**6.** Bulletin No. 1105 illustrating and describing explosion-proof and dust-tight Pylets for hazardous locations as defined in Article 500 of the N.E.C. Pyle-National Co.

**LOOM TRANSFORMERS**

**7.** Catalog Section 75-030 describing air-cooled control transformers designed for applications requiring circuit insulation and also to provide voltage changes for practical and economical operation of domestic and industrial apparatus. Westinghouse Electric & Mfg. Co.

**CABLE**

**8.** A folder featuring ANW cable for moist locations without lead sheath, for commercial and industrial applications. Anaconda Wire & Cable Co.

**VENTILATING EQUIPMENT**

**9.** A photo-manual entitled "There's Money in Circulation for You." It analyzes the various problems of air recirculation and cooling. Kisco Company, Inc.

**CONNECTORS**

**10.** Catalog No. 100, consisting of 88 pages of detailed descriptions, illustrations, and price list of pressure (solderless) connectors for wire, cable, rod, tubing and bar. Thomas & Betts Co., Inc.

**WELDERS**

**11.** Descriptive Data 26-320 covering the Midget Marvel Flexarc a.c. welder. Specifications for the welder are given. Westinghouse Electric & Mfg. Co.

**LIGHTING FIXTURES**

**12.** Catalog folder entitled "New Indoor Daylight for Factories" presents fluorescent lighting fixtures for use with the new fluorescent daylight mazda lamps. The Miller Co.

**SIGNALING**

**13.** Catalog consisting of 70 pages including bulletins with descriptions and illustrations of annunciators, burglar alarm devices and systems, bells, buzzers, chimes, howlers, sirens, transformers, letter boxes, inter-communicating telephone systems, hospital nurse call systems, rectory call systems and fire alarm systems. Partrick & Wilkins Co.

**AMBER VARNISH**

**14.** A pamphlet featuring amber and amber varnish. Outstanding electrical properties of amber are now available in this fluid form. Amber Mines, Inc.

*(Continued on page 77)*

## CIRCLE NUMBERS—SIGN—AND MAIL

**ELECTRICAL CONTRACTING** **May**

**330 West 42d St.**
**New York, N. Y.** **(Not good after July 1st)**

**Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| 34 | 35 | 36 | 37 | 38 | 39 | 40 | | | | |

NAME.....TITLE.....

COMPANY .....

ADDRESS .....

CITY..... STATE.....

**LIGHTING UNIT**

**15.** A folder giving facts about REMO-LITE for either rural or industrial use. 20th Century Engineering Co.

**SOLENOID OPERATING MECHANISM**

**16.** Descriptive Data 33-123 outlines a solenoid operating mechanism for fast reclosing high-voltage circuit breakers used in conjunction with carrier-current or high-speed relays. Westinghouse Electric & Mfg. Co.

**MOTORS**

**17.** Leaflet 2125-C describes explosion proof motors. Many construction and installation pictures shown. Allis-Chalmers Manufacturing Co.

**PANELBOARDS AND CABINETS**

**18.** Bulletin No. 57 consisting of 16 pages, describes "Dublbrak" circuit breaker panelboards and cabinets. Details of constructional advantages and suggested specifications are given. Frank Adam Electric Co.

**SWITCHBOARD INSTRUMENTS**

**19.** Catalog 48 illustrates, describes and lists the line of switchboard type instruments, rectangular and round pattern and all necessary accessories. Roller-Smith Co.

**LIGHTING**

**20.** A folder giving facts on Flex-O-Lite, a fluorescent tubing, for commercial and industrial lighting. St. Charles Technical Laboratories, Inc.

**MOTORS AND GENERATORS**

**21.** Leaflet No. 2183-A entitled "Lo-Maintenance Direct Current Motors and Generators." Equipment is described and illustrated, and details of construction are explained. Allis-Chalmers Mfg. Co.

**LINESTARTERS**

**22.** Leaflet 11-200 describing the nonreversing linestarters for squirrel-cage and wound-rotor motors. Westinghouse Electric & Mfg. Co.

**WIRES, CABLES AND CORDS**

**23.** Handbook-Catalog No. 10-E illustrates and describes wires, cables and flexible cords designed for use where electric wiring, either in conduit or open, is exposed to heat, fire hazard, corrosive fumes, vapors, oil or grease. Rockbestos Products Corp.

**CONNECTORS**

**24.** Bulletin No. 49 featuring Ilsco soldering lugs, solder-solderless lugs, fuse clips, sheet terminals, solderless lugs, solderless connectors, current transformer connectors, ground rod clamps, solderless terminal lugs, and solderless service connectors. Ilsco Copper Tube & Products, Inc.

**SIGNALING**

**25.** Folder consisting of 12 pages of data on bell transformers, signalling transformers, toy transformers, special transformers and electric door chimes. A. E. Rittenhouse Company, Inc.

*(Continued on page 78)*

**CORDS AND CABLES**

**26.** A folder entitled "An Engineering Analysis of Super Service Cords and Cables." A sample of Super 6-T is enclosed in folder. General Cable Corp.

**TRANSFORMERS**

**27.** Bulletin describing Gardner transformers. Numerous installation pictures. Detailed tables of specifications are also included. Gardner Electric Manufacturing Co.

**LIGHTING**

**28.** A folder entitled "Apply Fluorescent Lighting the NU-RESCENT WAY." Details on design, construction and essential data given. Frank Kelley, Inc.

**BEARINGS**

**29.** Catalog 390 listing bronze bearings, bronze bushings, bronze bars, electric motor bearings, and graphited bronze bearings. Price list is included. Johnson Bronze Company.

**CONTROLLERS**

**30.** Descriptive Data 9600 on d.c. magnetic crane controllers for hoist, bridge and trolley service. Westinghouse Electric & Mfg. Co.

**LIGHTING SPECIALTIES**

**31.** Catalog No. 3 consisting of 36 pages of descriptive material on Red Spot lighting specialties. Many photographs and line drawings included. The F. W. Wakefield Brass Co.

**MACHINE TOOLS**

**32.** Bulletin No. 1196 entitled "Making Machine Tools Earn Their Way with Allis-Chalmers Lo-Maintenance Motors." Consists of 16 pages and illustrated with a variety of installation photographs. Allis-Chalmers Mfg. Co.

**MOTORS**

**33.** Bulletin No. 508E describing and illustrating a.c. and d.c. explosion-proof motors. Construction features listed. The Louis Allis Co.

**FANS**

**34.** A folder entitled "Like living at the Seashore!" featuring the apartment model and attic type fan. Chelsea Fan & Blower Co., Inc.

**GROUND ROD**

**35.** Publication C-14 features the Star ground rod and Everdur ground wire clamps. It contains pertinent information relating to use of ground rods and other data of value. Anaconda Wire and Cable Co.

**SWITCHES**

**36.** Pamphlet 15-100 illustrating and describing type SM heavy duty master switches for mill and crane controllers. Westinghouse Electric & Mfg. Co.

**CONDUIT FITTINGS**

**37.** A folder featuring Pylets, an improved type of heavy duty conduit fittings designed for easier applica-

(*Continued on page 79*)

tion, greater strength and maximum security of wiring installations. The Pyle-National Co.

**PUMPS**

**38.** Leaflet 2199-C covering single suction, single stage close coupled utility pumps for every industry, handling from 10 to 1600 gpm and using motors up to 75 h.p. Allis-Chalmers Mfg. Co.

**TRANSFORMERS**

**39.** Pamphlet 75-240 contains the description, use, footage chart and catalog listings of luminous tube specialty transformers, for both indoor and outdoor installations. Westinghouse Electric & Mfg. Co.

**CIRCUIT BREAKER**

**40.** A folder describing Type "AT" general utility enclosed circuit breaker. Photographs, application, features and details of construction are included. Trumbull Electric Mfg. Co.

## More Gossip

### Industrial Foresight

Lighting trends in future years were anticipated in planning a new addition now taking form in Rochester, N. Y., for a camera manufacturer. The layout provides No. 10 branch lighting circuits. These are only partially loaded, so as to handle future demand. The Dwyer Electric Co. is doing the work.

### Speaking of House Wiring

A $260,000 electrical job for one home seems incredible, but that is the way it worked out several years ago for Alexander H. McDaniel, Inc. of Wilmington, Del. However, this was a $6,000,000 country mansion which took almost 3 years to build. Unspoiled by this unusual assignment, the McDaniel firm has since kept busy wiring smaller houses and commercial establishments.

*HAPPY PAIR—Frank M. Keinz (right) smiles with satisfaction at having 40 active members in the Electrical Contractors Association of Utica, N. Y., of which he is secretary. Thomas F. Farley, however, is more concerned with his recent $12,000 contract for wiring a new gymnasium and swimming pool building for Hamilton College.*

### How Services Grow

A Washington, D. C. department store recently began a service replacement job which provides 28,000 amps. capacity per phase for its 4-wire service. Quite a contrast to the 600 amp. service that was installed for the first section of this store in the days before air conditioning, better lighting, escalators and other modern shopping requirements. The Howard P. Foley Co. Inc. has this work under way.

*COMPLETE SERVICE—large industrial and commercial contractors of Buffalo, N. Y., maintain elaborate stocks of supplies and apparatus to render a complete service to their customers. At the Bison Electrical Co., Inc., Joseph T. Arundell has a service counter where the regular line of maintenance materials, fittings, lighting equipment and other needs of the plant may be obtained. It is an adjunct to handling heavy construction work for the larger plants.*

### Barber Shop De Luxe

The Hotel Du Pont barber shop in Wilmington, Del. recently underwent a $30,000 face lifting which incorporates a new technique in lighting. Flush prismatic ceiling lenses given off "surprise pink" illumination which accentuates the manly countenance, imparting that glow of complexion commonly referred to as being "in the pink". It is another idea for the alert lighting man. Yes, J. M. Alexander of Hatzel & Buehler, Inc. is quite proud of this installation.

### It All Counts

Perhaps the southernmost large motor shop of the United States is the Tampa (Fla.) Armature Works. One good reason for its becoming a really large shop is that all classes of work were given close supervision. Work in this shop ranges from huge motors out of nearby phosphate mines to small refrigerator motors. Five men are employed in the small motor department alone. Two men are kept out on apparatus sales. This firm also handles larger air conditioning work for theatres and other business concerns in Florida cities.

### House Circuit Survey

A survey of recently wired homes was made by electrical inspectors in the District of Columbia to check the trend in branch circuit provisions. They found that 50 per cent of their 8-room houses with recreation rooms and oil burners use eight to ten circuits, and the rest have more circuits. Among the larger 6-room homes, about 60 per cent use 6 circuits, while 40 per cent exceed 6 circuits. Of the smaller low-cost six-room homes about 80 per cent have 4 circuits and 20 per cent six circuits.

### Shop Modernization

Motor service shops must be prepared to take on a broader scope of work, believes T. T. Evans of Mather, Evans & Diehl Co., Inc., Utica, N. Y. This shop has equipment for electric arc and gas welding and is now adding modern machines for cutting gears and milling shafts. In addition to the actual need of good equipment for doing its regular line of motor work, the machine shop can take on jobs that regular customers would send elsewhere.

*HEADS SEATTLE BUREAU—R. D. Horning, Manager of the Seattle Electrical Contractors Association since 1936, was recently named chairman of the Seattle Adequate Wiring Committee. The A/W story was presented at the recent Seattle housing exposition by means of a five-room house, built and wired by the local A/W bureau.*

# EQUIPMENT News

## Bar Hangers

A new "S" shaped bar hanger, designed for mounting between joists rather than on the joist face. It imparts increased rigidity to the installation and eliminates plaster surface bumps. Fits all joist spacings from 5 to 16 inches. Hanger's edgewise position between joists supplies added strength. Small locating tab is furnished on each hanger stud to facilitate setting hanger at various distances from face of joist to accommodate boxes of different depths. Fixture stud is anchored to bar by center set screw. Locknut secures box to fixture stud. Either box or stud can be locked independently of the other. General Electric Co., Bridgeport, Conn.

G.E. BAR HANGER

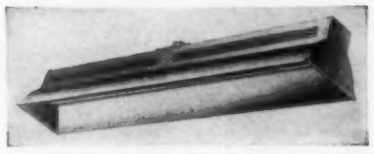
■

## Floodlight

A portable floodlight, known as Flexolite, may be quickly and easily attached to horizontal or vertical surfaces by means of an adjustable bracket and a two-screw mounting plate. For use in basement workshops, garages, gardens and recreational areas. It is a weatherproof fixture finished with three coats of vitreous-fired porcelain enamel. Available in two sizes to accommodate 100, 200 or 300 watt medium base lamps; equipped with rubber cord, plug and medium base socket. Goodrich Electric Co., 2900 N. Oakley Ave., Chicago, Ill.


Flexolite

GOODRICH FLEXOLITE



BENJAMIN FLUR-O-LINE UNIT

## Fluorescent Lamp Units

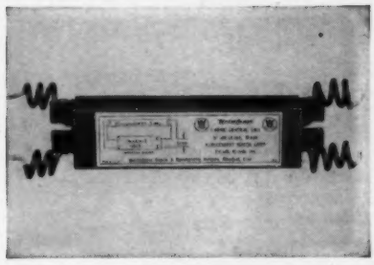
These unit-section-reflector type, single-tube fluorescent lamp fixtures, known as Flur-O-Line, have been designed to make it possible to build up from a number of basic unit-sections almost any size and shape of composite, multiple-lamp fixtures. Recommended to light large surfaces of inspection and assembly tables, as well as long production lines. Each single lamp, unit-section reflector is a self-contained fixture. Detachable wiring-channel which houses auxiliaries, conceals the wiring and with various accessory fittings available makes possible end-to-end or side-by-side attachment of units. Available for 18-, 24- and 36-inch lamps and can be supplied with or without auxiliaries. Benjamin Electric Mfg. Co., Des Plaines, Ill.

■

VAN DORN UTILITY DRILL

## Drill

A new ¼-inch utility ball bearing drill has been added to the Van Dorn line. It has a no-load speed of 1100 r.p.m. Deep-groove ball-bearing on chuck spindle, with inner and outer races locked in place, absorbs thrust in all directions. A splined gear mounting on spindle increases strength and reduces noise and wear. Removable commutator covers allow for easy brush inspection. Has additional chuck capacity, often desired in maintenance and repair work in industrial plants. Van Dorn Electric Tool Co., Towson, Maryland.



WESTINGHOUSE CONTROL UNITS

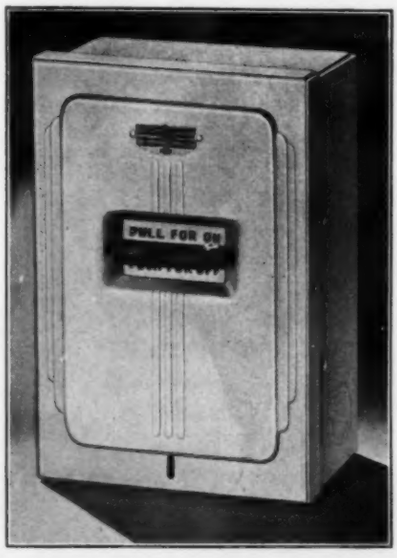
## Control Units

Fluorescent lamp control units are designed to be used with tubular fluorescent lamps to maintain current and voltage at proper values. Each lamp requires control unit suited to the electrical operating characteristics of the fluorescent lamp selected. Operation is on a.c. circuits only and over-all power factor for a lamp and control unit is approximately 60 per cent. Units are built complete in a compound-filled case including a thermal switch for starting, a reactor or transformer to provide proper current and voltage and a small capacitor to eliminate radio interference. For outside use, control units must be protected from the weather. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

■

## Enclosed Switch

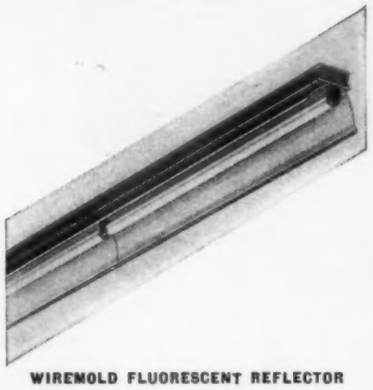
This front-operated Type D enclosed switch is known as the "D" Puller. Rated at 30-amperes, complete line consists of Bulletin 4140 devices for 2 and 3 wire solid neutral service, and 2 pole, 250 volt switches. Available with and without dead-front plates. Bulletin 4302 covers a specially designed water heater switch with grounded neutral and dead-front construction. Case is finished with rust-resisting aluminum and provides good ground connection. Cutler-Hammer, Inc., 228 N. 12th St., Milwaukee, Wis.




• CUTLER-HAMMER "D" PULLER

## Fluorescent Reflector

A concentrating type reflector designed for applications of the fluorescent lamp and Wiremold fluorescent strip. Reflector available in lengths corresponding to three lengths of fluorescent lamp, 18-in., 24-in. and 36-in. Reflector is designed to incorporate advantages of parabola for effective and efficient control of light. Has adjusting feature which permits reflector to be set in any one of three positions. May be mounted in normal position or tilted to a maximum angle of 45 deg. Intermediate position sets reflector at an angle of approximately 22½ deg. from normal. The Wiremold Company, Hartford, Conn.



WIREMOLD FLUORESCENT REFLECTOR

■

G-E AUTOMATIC BATTERY CHARGER

## Battery Charger

Automatic copper oxide battery charger for telephone service. It offers advantages to smaller PBX's and PAX's and is simpler in construction, installation and adjustment. Has a sensitive, built-in inverse-temperature-compensated voltage control, which automatically starts charger when battery voltage falls to a predetermined point, and cuts off charge when it rises to a predetermined point. Sizes range from 2-12 amperes for charging 11-12 cell batteries and from 1-6 amperes for charging 23-24 cell batteries. General Electric Company, Bridgeport, Conn.

## EQUIPMENT NEWS

[FROM PAGE 81]

### Tape

A new combination friction and rubber tape, known as U. S. Twinsulation Tape, is adaptable to all kinds of electrical work. Due to Twinsulation's high dielectric strength, less tape need be applied than is the case with ordinary commercial friction and rubber tape. In most cases, less than half the footage is necessary to make a safe splice, it is claimed. A splice made with two plies of Twinsulation tape will withstand a test voltage of approximately 12,500 to 15,000 volts. United States Rubber Company, 1790 Broadway, New York.

■

### Safety Switch

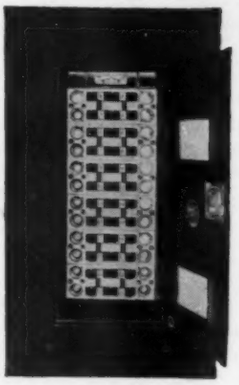
The Rocker type safety switch, a 30-ampere front-operated enclosed switch, has a curved molded handle which is rocked by thumb action to "on" or "off" position. Handle and switch are all one piece, operating on frictionless knife-edge bearings. Provision is made on handle for marking circuit legend. Some of the features are positive action full-floating contacts, screw type wiring terminals, ten well-placed knockouts, silver-surfaced current-carrying parts. Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit, Mich.

BULL DOG SAFETY SWITCH

■

### Panelboards

Rocker type panelboards are a companion development to Rocker type switch. Rocker handles make "on" and "off" operation safe, simple and sure. Circuit name or number can be written on a card inserted in handles. Panel unit is of porcelain for maximum dielectric strength and resistance to heat. Other features are wiping action assuring clean contact surfaces, quick-make and quick-break switch action, exposed screw type wiring terminals, silver-surfaced current-carrying parts, molded "on" and "off" markings. Available in circuits from 4 to 40, in multiples of 4. Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit, Mich.



BULL DOG PANELBOARD

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### Floodlight

Utilite No. 100 is a portable utility floodlight, intended to provide temporary lighting when needed for work or play after dark in places not usually permanently lighted, such as around the home, garage, garden and yard. Designed for use with 100 to 300 watt lamp. Spring clamp permits easy hand mounting on anything convenient up to 2 inches thick. Ball and socket attachment makes it possible to adjust position of reflector in any direction. Unit provided with a 20 ft. cord and attachment plug so that light can be used over a wide area from any convenient outlet. Steber Manufacturing Co., 126 No. Union Ave., Chicago.

STEBER UTILITE

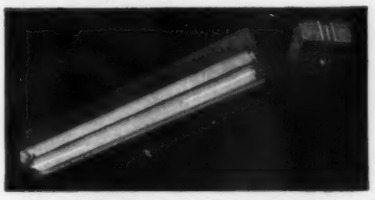
■

### Deep Drying Varnish

A new baking varnish for insulating electrical windings, known as Synthite PG-1, is claimed to dry throughout very deep windings without surface sealing causing uncured varnish to become trapped in the interstices of windings. Deep curing is accomplished without wet spots or trapped solvents, while also leaving the cured mass flexible. Dielectric tests show values in excess of 1800 volts per mil. This clear baking varnish is oil and waterproof and is said to have excellent acid and alkali resisting properties. The John C. Dolph Company, 168 Emmett St., Newark, N. J.

## Fluorescent Connector

Ingenious combination of fluorescent units and connectors by which fluorescent tubes may be built up into varied designs. Trough like unit contains tube and transformer, and provides a double parabola reflector. Can be interconnected in different patterns with or without use of connector. Made from heavy gauge steel finished in satin chromium. Reflector has baked enamel. Only two wire leads need be connected to circuit. Sizes for 18 in., 24 in. and 36 in lamps. Connector size—4¼ inches by 4¼ inches. Auxiliary and sockets mount on back plate which serves as template in laying out designs. Wiring and interconnecting done in open, before reflector housing is slipped into place. The F. W. Wakefield Brass Co., Vermilion, Ohio.



WAKEFIELD CONNECTOR

## Indirect Pendant

"Rival" indirect lighting pendant for low-priced field, with emeried Alzak finish. Canopy has knockout for levolier switch and self-aligning fittings. With one arm released, bowl swings down for cleaning and relamping. Socket cover finished where needed on low ceilings. Two sizes, No. 1050 for 500 or 300-watt Mogul and No. 1051 for 1000 or 750 medium bipost lamps. Curtis Lighting, Inc., 1123 West Jackson Boulevard, Chicago, Ill.

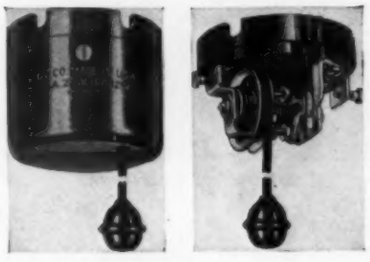
CURTIS INDIRECT PENDANT

# EQUIPMENT News

[FROM PAGE 83]

## Ceiling Switch

The new Textolite ceiling switch, Cat. No. GE857, replaces a previous switch of the same number which had a porcelain base and metal cover. Steel frames are anchored with two screws at each end. Blades, contacts and spring are extra heavy. Strong operating spring in switch mechanism. Top wiring facilitates installation. Pull cord is sturdy and durable. Slot in wheel permits easy cord replacement. General Electric Co., Bridgeport, Conn.



G.E. CEILING SWITCH

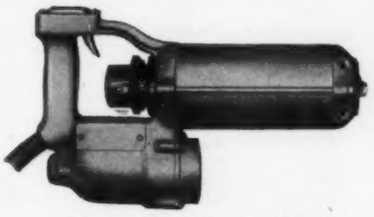
## Circuit Breaker

An electro magnetic circuit breaker designed for assembly in lighting panelboards as used in modern homes, stores, factories and office buildings. It operates without thermal elements. Magnetic trip with time delay gives delayed trip on harmless overloads and instantaneous trip on short circuits. Available in 10, 15, 25, 35 and 50 ampere sizes to operate on 125-volt a.c. Heinemann Electric Co., Trenton, N. J.


HEINEMANN CIRCUIT BREAKER

## Electric Hammer

A super-power 2-inch electric hammer for operation on 110 volt a.c. lighting circuit. Using star drills, holes up to two inches in diameter can be drilled in hard concrete. Using stone points of cold chisels, it will cut holes through masonry floors and walls for risers, doors, windows. Will drive up to ¾-inch cold rivets. Has high speed blower in handles, that keeps magnet windings cool. Hammer is 16 inches overall, 3½ inches in diameter and weighs 25 pounds. Designed primarily for heavy construction drilling and cutting and for large plant maintenance work. Syntron Company, Homer City, Pa.



SYNTRON ELECTRIC HAMMER

## Raintight Enclosed Switch

Raintight type "D" switches, 30–200 ampere, fusible, have been added to the Trumbull line of enclosed safety devices. These units especially applicable for sign lighting installations. Furnished in aluminum finish both inside and out making an easy to wire, neat appearing device. Trumbull Electric Mfg. Co., Plainville, Conn.

TRUMBULL ENCLOSED SWITCH

## Hi-Volt Indicator

This pocket instrument used for indicating presence of potential when held in changing static field such as static from belting, high frequency, X-Ray equipment, alternating current circuits, pulsating direct current, condenser discharges, automobile ignition. Glow tube lights up instantly in a changing static field. Gives positive indication on 2,000 volts and up. Equipped with clip and slips into vest pocket. Ideal Commutator Dresser Co., Sycamore, Ill.

IDEAL HI-VOLT INDICATOR

# Advertisers' Index



* See 1938–1939 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.

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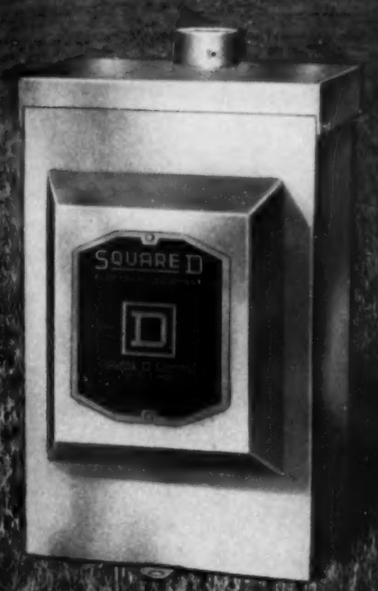


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